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► MINIMUM BS

MARCH 99

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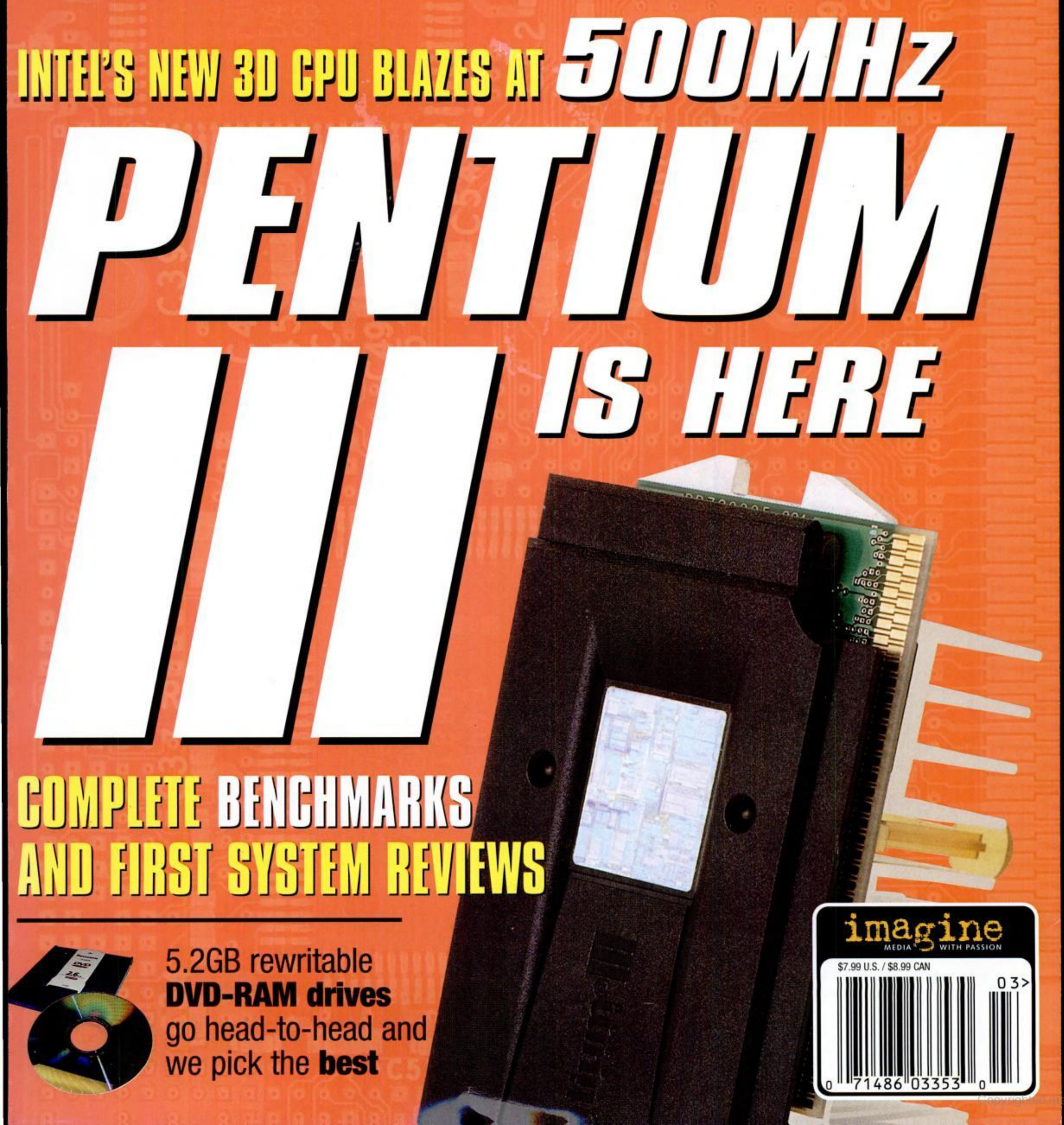

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intel inside
pentium II processor



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The Critics Rave

*New!*
PC MAGAZINE EDITORS' CHOICE
Millennia C400
Feb '99

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Millennia 400 MAX
#1 Power Desktop
#1 Gaming System
Dec '98

PC WORLD BEST BUY
Millennia 450 MAX
Best Buy
Nov '98

PC WORLD BEST BUY
Millennia 400 DVD
Sept '98
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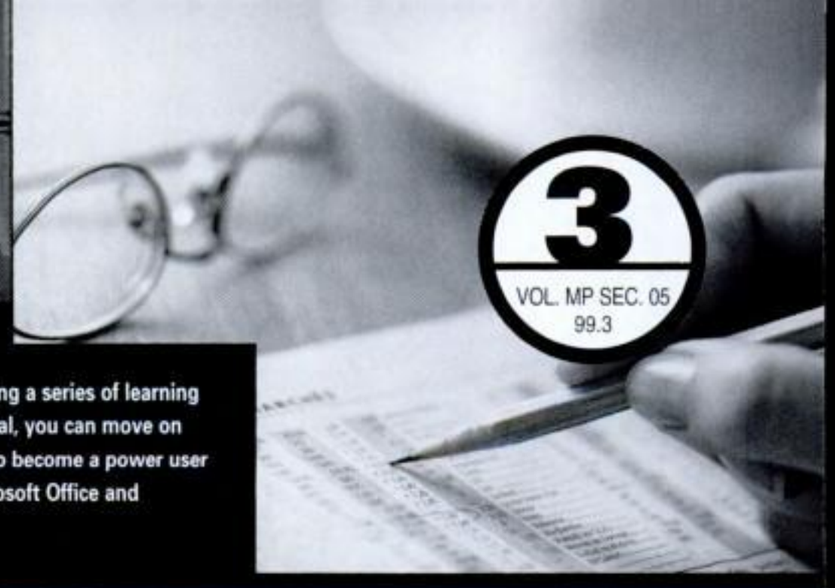


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| Cache | 128KB internal L2 cache | 512KB internal L2 cache | 512KB internal L2 cache | 512KB internal L2 cache |
| RAM | 64MB SDRAM | 64MB 100MHz SDRAM | 128MB 100MHz SDRAM | 128MB 100MHz SDRAM |
| Hard Drive | 8.4GB Ultra ATA hard drive◆ | 8.4GB Ultra ATA hard drive◆ | 13GB Ultra ATA hard drive◆ | 13GB Ultra ATA hard drive◆ |
| Monitor | 17" Micron 700Vx monitor (15.9" display) | 17" Micron 700Vx monitor (15.9" display) | 17" Micron 700Vx monitor (15.9" display) | 17" Micron 700Vx monitor (15.9" display) |
| DVD/CD-ROM | 40X max speed CD-ROM drive | 40X max speed CD-ROM drive | 6X DVD-ROM drive (free upgrade from 4.8X DVD-ROM drive) | 6X DVD-ROM drive (free upgrade from 4.8X DVD-ROM drive) |
| Modem | 3Com USRobotics V.90 WinModem** | 3Com USRobotics V.90 WinModem** | 3Com USRobotics V.90 WinModem** | 3Com USRobotics V.90 WinModem** |
| Graphics | nVidia Riva 128, 8MB SGRAM 3D 2X AGP graphics | nVidia Riva 128, 8MB SGRAM 3D 2X AGP graphics | 16MB Diamond Viper 550 TnT 2X AGP graphics | 16MB Diamond Viper 550 TnT 2X AGP graphics |
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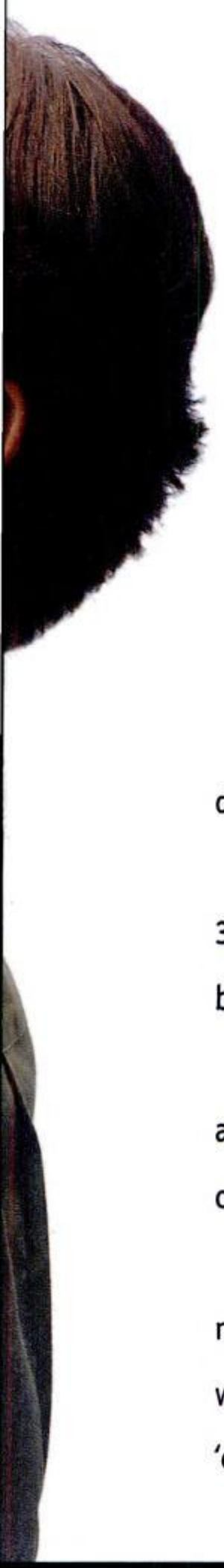

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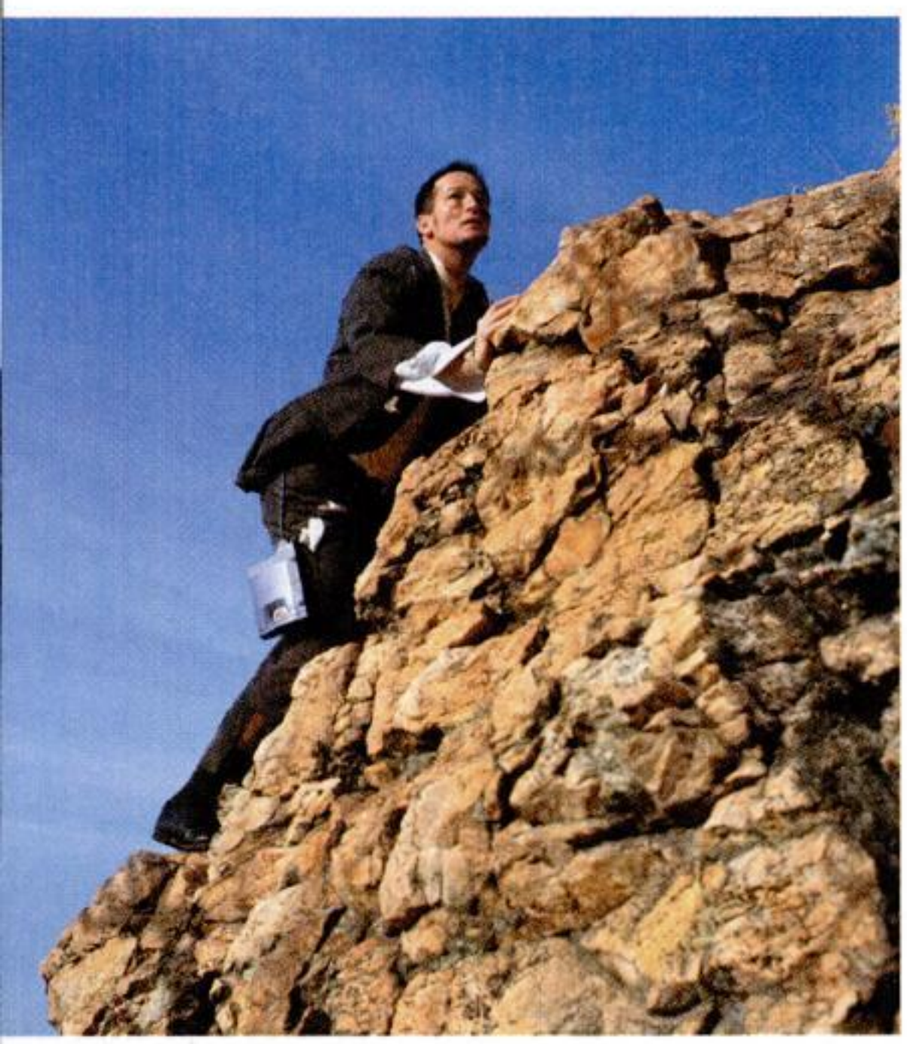
# MAXIMUM PC

▶ MARCH 1999

## 62 Pentium III: Katmai Cometh

Intel's fastest processor ever includes 70 new instructions to supercharge everything from 3D games to imaging apps. Here's our full report on the technology, upgrade path, and benchmarks—plus reviews of three hot 500MHz systems.



## 42 Interrogation: Iomega

Now that Iomega is the last man standing in the removable storage wars, President **Ted Briscoe** discusses the fall of Iomega's competitors, the future of the Zip drive, and the "Click of Death" that devastated many customers

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Kick off your shoes and brew a fresh pot of coffee—you're working at home today. We give you the best office peripherals you've ever seen. Printers, scanners, networking kits, video-conferencing cameras, and software.



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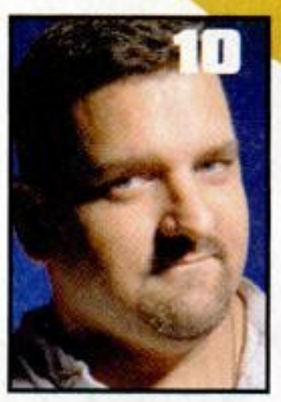

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## ▶ NEWS


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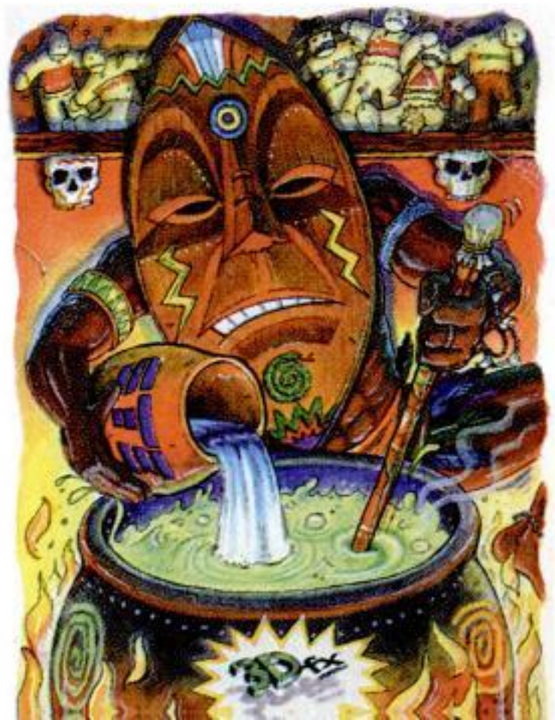
**News you need to win the tech race**

▶ Double, double, toil and trouble. Voodoo burn and Banshee bubble. 3Dfx mixes up a new batch of mojo by buying STB and sticking pins in all its former OEM partners. Will the Voodoo$^3$'s magic keep it afloat or will 3Dfx collapse under its delusions of grandeur.

▶ **Also:** Rumblings from Intel signal that the glory days of over-clocking are numbered. What new nefarious scheme will block our overclocking delights, and more importantly how can we get around them? We give you the straight poop.



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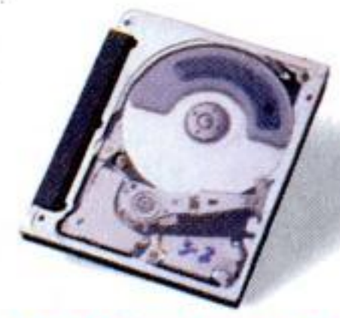

IBM Microdrive, p.72

**75 Reviews**
We jump all over the hottest new hardware and latest software like a gorilla on Samsonite.

**Highlights include**: The first two **DVD-RAM drives** hit our labs, hyperspeed **Ultra2 SCSI hard drives** from IBM, Seagate, and Western Digital, the awesome Pentium II power of the **WinBook XL$^2$**. Apps include **HomeSite 4.0** and **Dreamweaver 2**, and four inexpensive **image editors**. On the gaming tip we cover **Starsiege: Tribes**, **Heretic II**, **Tomb Raider 3**, and **Kings Quest: Mask of Eternity**.


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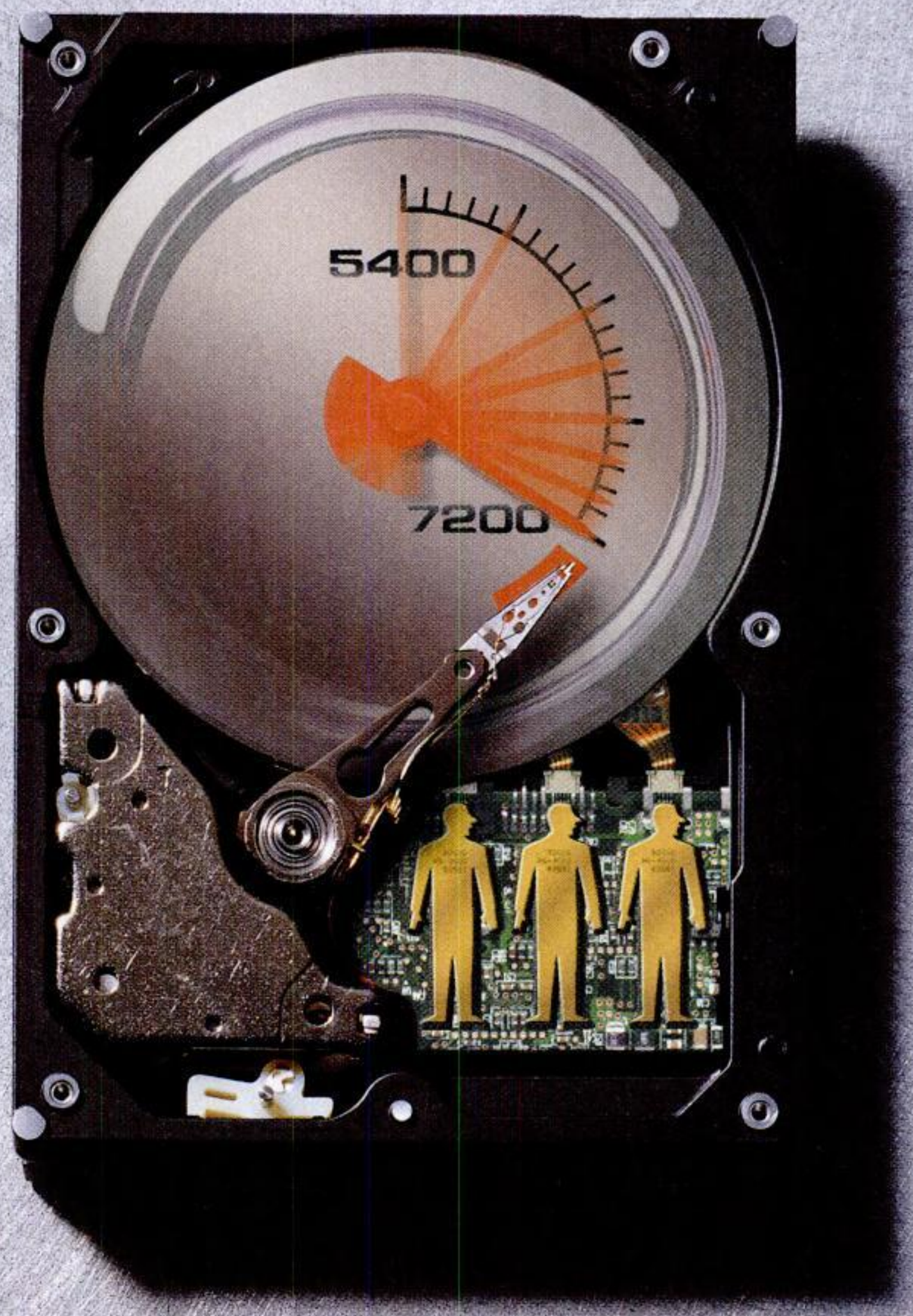
# 7200 RPM performance.

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[just ask goliath]

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MVP
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Xeon LVD Raid

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- 512KB Cache, Expandable to 2 CPUs
- 256MB SDRAM Expandable to 2GB
- Slots: (6) PCI, (1) ISA, (1) AGP
- Creative Labs 128 PCI Sound
- #9 Revolution 4 32MB AGP video
- Q:(2) 9GB 10,000RPM LVD (5.0ms)
- Removable HD
- AMI 466 Ultra 2 LVD Raid 0-5 Controller
- Sony 32X CD-ROM, Keyboard, Floppy, Mouse
- Tower Case 300 Watts

$4613

Accel Galaxy 52MB Dual Port Video $6300

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**POWER STATION**

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- 512KB Cache, Upgradeable to 2 CPUs
- 64MB SDRAM
- Slots: (5) PCI, (2) ISA, (1) AGP BX Chipset
- IBM 10GB 7200 RPM Ultra-33
- Sony 32x CD-ROM
- NEW! Diamond N Vidia 16MB TNT AGP Video
- Keyboard, Floppy, Mouse
- Mid-Tower Chassis

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9GB LVD 10,000RPM Solution $2550

Raid Upgradeable

### STA DUAL XEON 400 MHZ

- 1 Intel Xeon 400Mhz Processor
- 512KB Cache, Expandable to 2 CPUs
- 128MB SDRAM Expandable to 2GB
- Slots: (6) PCI, (1) ISA, (1) AGP
- Sound and Ethernet 10/100 by Intel
- #9 Revolution IV 32MB AGP 2X Video
- IBM 14GB 7200RPM IDE Removable HD
- Sony 4x2x CD Recorder
- Keyboard, Floppy, Mouse
- Full Tower 300 Watts

$2547

9GB LVD 10,000RPM Solution $3144

### CELERON 333 MHZ

- 1 Intel Celeron 333Mhz CPU
- 128KB Cache
- 32MB SDRAM
- Integrated:
  - Creative Labs PCI Sound
  - 8MB N Vidia 128 AGP Video
- 4GB Ultra 33 HD
- Slots: (3) PCI, (3) ISA
- Sony 32x CD-ROM; Keyboard, Floppy, Mouse
- Surround Sound Speakers
- Desktop Chassis
- Intel Landesk Client Manager

$693

### STA PII 350

- 1 Intel Pentium II Xeon 350Mhz CPU
- 512KB Cache
- 64MB SDRAM
- Slots: (3) PCI, (2) ISA, (1) AGP
- 6GB Ultra HD
- Sony 5x DVD CD-ROM
- Real 3D Starfighter 8MB AGP
- Sound with Subwoofer Speakers
- Keyboard, Floppy, Mouse
- Desktop Case

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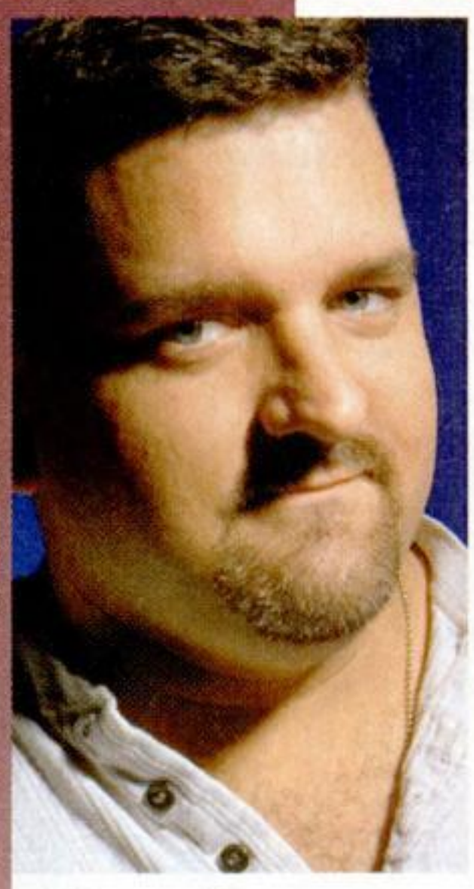
# One Born Every Minute



**These lies would be laughable if there weren't any victims. But there are.**

I definitely didn't want to write about the iMac again. After all, our critical review of Apple's savior back in October earned us reams of emotional e-mail and Usenet flames from Macophiles pointing out how popular the li'l-Mac-that-could has proven to be (with the tech naive). But we had our say, we backed it up with facts, and we quietly stood by our position.

Until now.

I feel compelled to reenter the fray because I'm tired of Apple's misrepresentations and the celebration of this overhyped underachiever that perpetuates technological obsolescence.

As I write this, Apple has announced yet another profitable quarter. Our sister pub, *MacAddict*, gave the iMac its highest rating. And Jeff Goldblum continues to prattle on radio and television about how fab this little box is.

I understand Goldblum is an actor paid to recite lines, but when he spouts outright lies such as there's never been a non-beige PC (what about Sony, Compaq, and Intergraph?), that the iMac is only one piece (true, if you don't use the mouse or keyboard on this modern art piece), or that getting on the Internet is one click away (must be a mighty trusting ISP), it's hard to respect him.

The latest news out of Cupertino is that John Carmack is "100 percent behind Apple," which doesn't seem to jibe with the man's own PLAN file. "Cautiously optimistic" would be my take. One report I heard described Apple's adopted API, OpenGL, as "the PC standard for 3D graphics." Well, let's count how many currently active game engines run OGL as opposed to Direct3D. Hmmm, a small handful versus hundreds, maybe thousands.

These lies would be laughable if there weren't any victims. But there are. Everyone who buys this bargain-bin technology dressed up in designer duds is a victim.

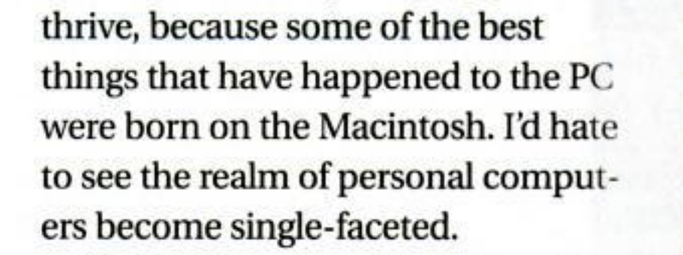
The single biggest issue consumers have with technology is obsolescence. They pay their money and a year later it won't run the software they just bought. Everyone else is playing the latest game, running the latest creativity app, or accessing the latest streaming media on the web, but alas, the iMac owners can't.

I'm sorry, but you have no excuse if you bought from the back of the curve to save a buck. If you're bright, you learn to buy as forward in the curve as your budget will allow and get more ride for your buck. If you're not so bright, you try to cheat the curve again, only to regret it next year.

Many who read this will write it off as typical anti-Mac sentiment from a PC mag. They'll assume I have to toe this line to protect my precious platform. Not true. Whether you choose to believe this or not, my first computer was a MacPlus. I worked on Macs all through the DTP revolution and even founded a Mac User Group. I just dig tech and I sincerely want Apple to thrive, because some of the best things that have happened to the PC were born on the Macintosh. I'd hate to see the realm of personal computers become single-faceted.

But I believe the only way to solve a problem is through honesty. No amount of hollow hype or inflated reviews will to make the Mac platform improve. Hard, honest looks at the technology will.

The biggest difference between my MacPlus back in '86 and the iMac today is that my MacPlus was a state-of-the-art, no-excuses, quality machine with a legit life-span. The iMac had one foot in the grave at birth, and I just can't bear to see people buy into this delusion.



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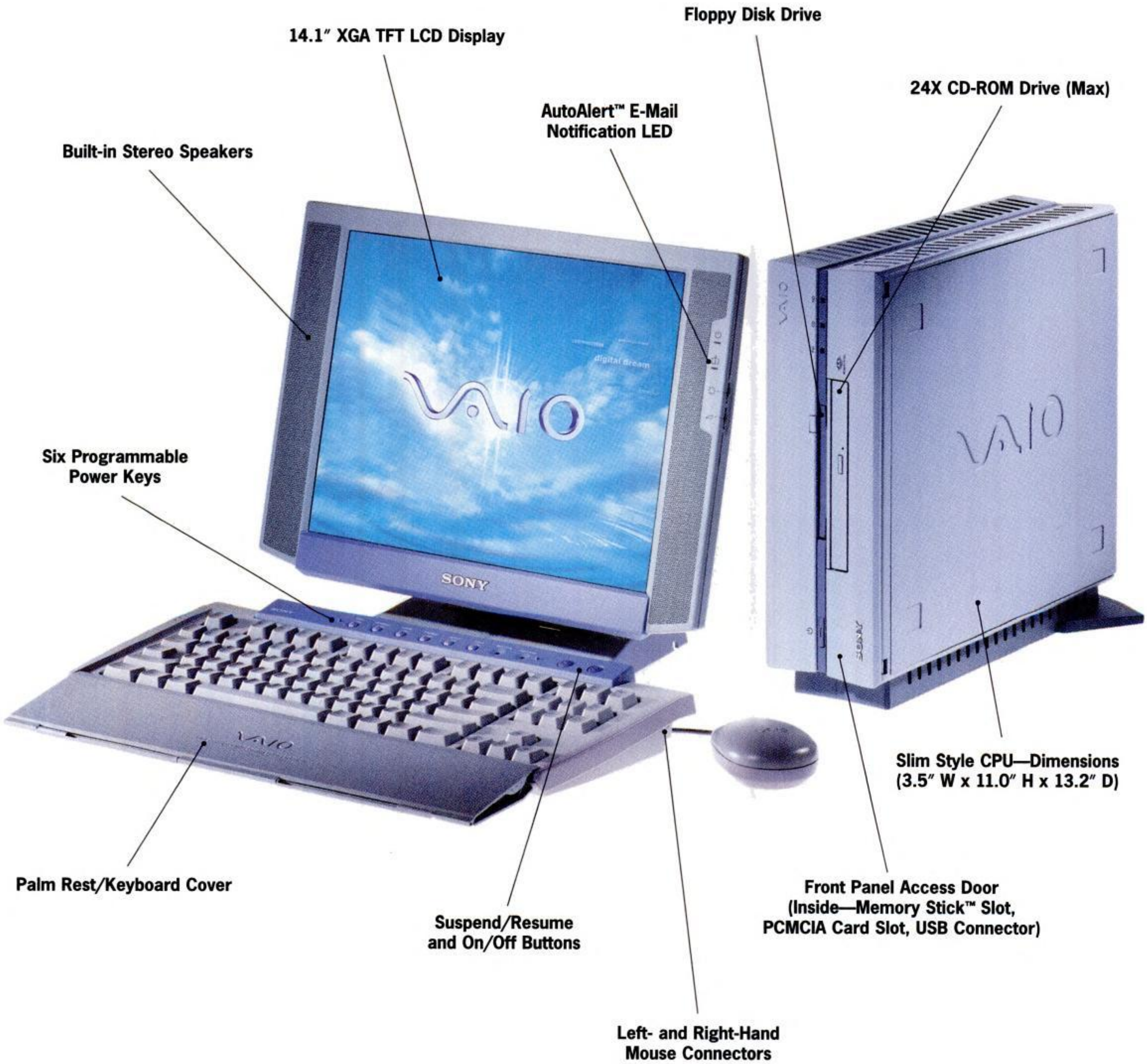


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# Letters from the Smartest Readers in the World

Here's the deal: You (being the smartest readers in the world) write letters about the magazine, the PC industry, the software you love or hate, and the hardware that runs it. We read it and share as much of it as space permits in the mag and online, and respond or comment when the letter calls for it. Get it? Now get busy and write us at **commport@maximumpc.com**

## The Truth About AGP and Dogs

Since *Maximum PC* claims to be the only mag with attitude, I figure the chances of a response are best with you. However, I'm not holding my breath.

No one seems to be willing to discuss this subject, or even acknowledge its existence, although those of us out in the trenches, building systems and performing upgrades, are well aware of it. I am speaking of the inability of Super 7 motherboards to run AGP. Specifically, the AGP chipsets provided by SIS, ALI, and VIA, which were designed to allow the useful life of the Socket 7 platform to be extended by providing two essential items: the 100MHz frontside bus and the AGP port. No one I know has been able to get AGP 2x/DME functional using a motherboard containing chipsets from any of these manufacturers. All it takes is a short visit to the Matrox G200 forums or the Riva TNT forums to see that the only people able to utilize the full functions of the AGP port are those with Intel BX-based motherboards. I have yet to read an article addressing this issue, which is of prime importance to those of us who have spent our hard-earned dollars on products we naively expected to work on our systems, only to find that we are capable of AGP 1x only, or AGP must be completely disabled in the registry to prevent lockups (as is the case with my SIS 5591 chipset). I'm appalled by the lack of forthrightness from motherboard manufacturers, Socket 7 CPU makers, chipset makers, and videocard companies to warn of this problem. Perhaps they figure if they ignore it long enough, we'll simply give up and stop complaining. It's interesting to note that the very thing that was to prevent the Socket 7 platform from fading into the sunset may well be its downfall, as system builders and tweakers like myself are ditching Socket 7 in favor of an Intel BX setup to get our videocards working properly.

*—Glenn McDonald*

**Senior Editor Andrew Sanchez replies:** I have to agree with you on this one. Super7 has had its share of AGP incompatibilities since the days of the Apollo VP3. Ever since AMD got out of the core-logic chipset business, folks such as VIA, SiS, and ALi have been living the Socket 7 good life. I've heard all the horror stories regarding TNT and MGA-G200 not working on Super 7. I encountered problems with Intel's i740 running on first-gen Super 7 AGP boards. Many of these problems have been addressed via driver updates, but sadly, others abound.

You may hate Intel for being monopolistic, but you can't fault them for making sure their hardware is working right.

## Dead On Arrival

How the heck can someone claim that a board or chipset is dead before it's released?

*—Troy Smith*

**Senior Editor Andrew Sanchez replies:** Simple. If the board or chipset does not meet or exceed current state-of-the-art, then folks can start claiming a particular technology is dead before it's released. Every technology category, whether it's videocards, CPUs, or core-logic chipsets, has features that all future products must have in order to survive in today's fly-by-night, six-month-life-span world.

For example, for a next-gen 3D accelerator to go toe-to-toe with the best currently available, it has to:

- ▶ perform single-pass multitexturing
- ▶ do 24-/32-bit rendering (including final rendering output and z-buffer accuracy)
- ▶ have at least 16MB of local video memory—more would be better
- ▶ do full AGP 2x with direct memory execution
- ▶ support large (greater than 256x256 pixel) texture resolution

For core logic chipsets, it would be:

- ▶ support for 100MHz SDRAM
- ▶ 100MHz+ system bus
- ▶ Ultra DMA/33 EIDE device support
- ▶ five-plus bus-mastered PCI slots
- ▶ dual USB ports

If your hardware doesn't have the juice to compete against the current state-of-the-art, stay home. So what if it plays last year's games even faster if it's not ready for tomorrow's impending technology.

"I am appalled by the lack of forthrightness from motherboard manufacturers, Socket 7 CPU makers, chipset makers, and videocard companies to warn of this problem."

## Rebates are Evil!

I think rebates are the biggest scam. I'm willing to pay a little more and not deal with the hassle of mailing in those rebates and waiting forever to get my money.


**This month:**

- ▶ **Super 7 AGP woes**
- ▶ **DVD vs. CD-ROM**
- ▶ **Bring back the Tracking Sheet!**
- ▶ **Obsolescence frustrations**
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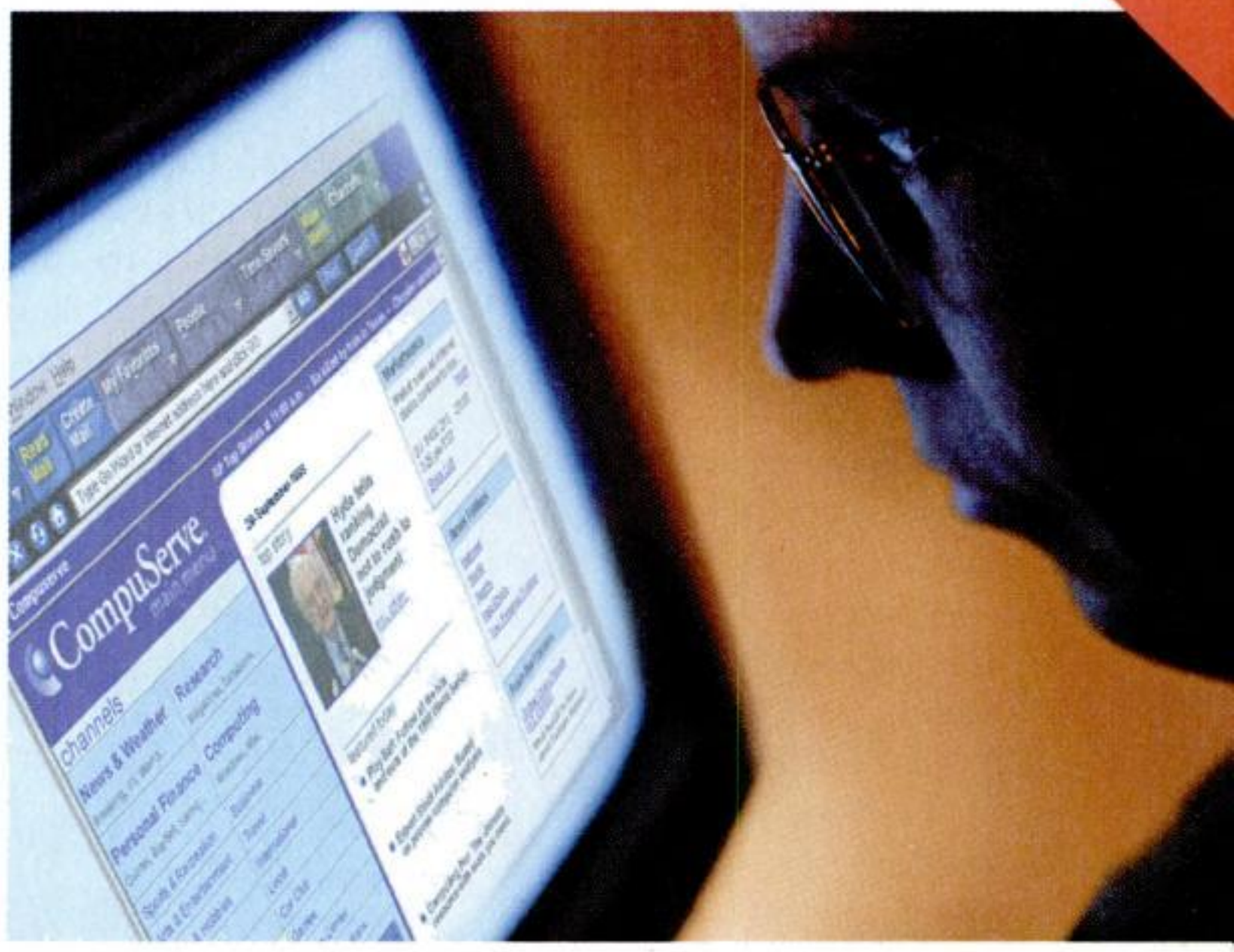

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I've mailed about $160 in rebates, but I've only received $40 in over a year. If businesses really cared about the consumer and wanted to offer a lower price, they'd just sell it cheaper. All too often these companies hire out private firms to process their requests, so when it gets screwed up, they can say it's not their fault. Iomega is terrible this way, and Sony is just as bad.

It's really deceiving the way mail-order catalogs are now selling items and marking the price down to reflect the rebate. If a product says $299, that's all I expect to pay. I shouldn't have to pay $349 and mail in a $50 rebate. Why can't the store do that and give me the discount now?

*—Richard Polgar*

**News Editor Bryan Del Rizzo replies:** Because the store isn't the one reaping the benefits of the rebate scam. The vendors are.

Let's pretend CompUSA sells a Sony drive for $299. Both Sony and CompUSA want to make as much money as it possibly can. This is called a profit margin. Let's assume a profit margin of 20%.

If CompUSA sells the Sony drive for $349, it would have to buy the drive from Sony for $290. As long as it didn't cost Sony more than $242 to build the drive, Sony would make 20% on the sale too. And everyone would be happy!

However, if both parties still want to make 20 points, but CompUSA decides to sell the drive for only $299, Sony would have to sell the drive to CompUSA for only $207.

By offering a rebate instead, Sony can still sell the drive $242, CompUSA can still sell the drive for $349, and you'll have a nice $50 rebate coupon. Both parties are hedging their bets that Joe Consumer (that's you!) won't be bothered to send in the rebate. More than likely, Sony will use a processing firm that gets a certain percentage amount for every rebate it processes. The rebate process takes forever because some processing firms just aren't equipped to handle the sheer deluge on a timely basis.

The bottom line? They're counting on you not filling out the rebate coupon.

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fter publisher's $50 mail-in upgrade
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"It's really deceiving the way mail-order catalogs are now selling items and marking the price down to reflect the rebate."

## Saved and Screwed by Nuts and Bolts

This is only the second time I've written to a magazine (the first time was when I was a kid and wrote to *Mad*.) Once again, I'm writing to another mad magazine! Anyway, I was one of the lucky ones who pre-ordered a Diamond Monster Fusion AGP (in the Monster Combo pack. I'm *still* waiting for the Monster Sound MX300). After I got it and installed it, there was almost no discernable improvement in performance.

At first I thought it was the poor drivers. So I did some research and found that the problem was most likely my system. That's when I decided I needed a utility program. I was reading the December issue of your fine magazine and saw a review for *Nuts & Bolts 98*. You gave it a 9/Kick Ass. Needless to say, I bought it. I got the platinum edition that comes with a bunch of other programs. Using *N&B98*, I found and fixed three things hindering the performance of my machine (which is a P-II 300 with 64MB RAM).

I did some tests in *Quake II* using the timedemo feature. Before fixing the problems, I was getting around 27fps (with sound, high texture level, 8-bit textures, and V-sync off.) I now get around 47fps! Wow, what an improvement! And that's with six *N&B* programs running in my tray! Even online, it is smooth and looks great! One time I even got 62fps, but I don't know how to duplicate that strange score. I just wanted to say thanks.

*—Shannon Edds*

Named as the "Best Utility" in *Maximum PC*'s Gear of the Year, *Nuts & Bolts 98* has fallen far short of my expectations. Furthermore, with a rating of 9/Kick-Ass, *N&B98* should run flawlessly or, at least, close to it. Instead, it erroneously reports physical RAM errors when, in fact, the memory is fine; reports the wrong amount of video RAM on the Matrox G200; indicates that a IBM DeskStar 8.4GB HD is only 4.1GB; and the list goes on.

I'm having a hard time understanding why your ratings of this product were so high given the extent of problems it generates. I wish I could point toward my ineptitude as the reason for the errors I noted above. Perhaps the $59 purchase price could then be considered an apt penalty for my ignorance. However, I encourage you to visit the *N&B98* support section of the McAfee web site—the problems are legion!

*—Joe Janetti*

## Advise and Consent

I just received the January 99 issue and in the review section on third-generation DVD, Sean Cleveland writes, "DVD is the word this year and the CD-ROM is dead." Thanks a lot! I just ordered a new Micron and chose not to get DVD because when you guys built the ultimate PC ("Dream Machine 98", September 1998), you didn't install DVD. You said there wasn't much software for DVD, and since 90% of the PCs have CD-ROM drives, software makers will continue to make CD-ROM software. What's the deal? Did I make a bad move by following your advice?

*—Rick Grothe*

**Technical Editor Sean Cleveland replies:** We didn't include a DVD-ROM drive in the Dream Machine because there weren't any out at that time that were multiread capabble (none could read CD-RW media). Also, all the DVD drives at that time were slow and clunky. The second- and even third-generation DVD drives that have since come out fix those problems. In fact, the latest DVD drives read discs at 32x. While it's too bad you didn't get a DVD drive, it's not going to hurt you anytime soon. DVD titles are only slowly trickling out (except, of course, for movies).

CD-ROM drives are dying because the current DVD drives read all CD media and offer DVD on top of that. And the prices continue to drop. Full death will occur when they reach the point of current CD-ROM prices. Save your pennies, because there are some better DVD drives coming out very soon. You'll actually be glad you waited.

## Upgrade Dead-End

I get very disillusioned with the PC industry, but it's also my passion. My upgrade path over the years has been extensive: 486/25, 486/66, P90, P166, P166 MMX. Each time, a new chip has meant a new motherboard. Why? These boards are built (and bought) with upgradability considerations, but when it comes down to it, I always end up having to replace the board completely. Money's not the problem (everything's so cheap nowadays), but it just seems such a waste. The current Socket 7 situation is the absolute worst. My board still has plenty of PCI slots, memory slots, and a Flash BIOS, but I have to



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buy a new board to use the new AMD chips. That'll be three Socket 7 boards I've had! So why should I bother? I'm going to Slot 1, giving me upgradability to Pentium III, right? Wrong! I've come to believe that despite the ease of fitting a shiny new P-III CPU on my board, I'm certain that the board manufacturers will not provide an upgradability path, leaving me to buy yet another new board. Everyone preaches the virtues of buying a good motherboard as the backbone of a good PC, but why bother? You'll just get screwed by the manufacturer when the time comes to upgrade your machine.

*—Richard Buckingham*

**Senior Editor Andrew Sanchez replies:** Moore's Law exists not only for CPUs, but core-logic chipsets. For every new CPU, there seems to be a new core-logic chipset sporting new, must-have features that'll have you cursing the day you bought your, ahem, new motherboard. Fear not, Richard.

With Pentium III, all you need is a new BIOS revision and your trusty old 440BX mobo, and you're in da Streaming SIMD Extensions house. Just make sure your mainboard supports an x 4.5 and x 5 multiplier. For Super 7 motherboard owners currently entrenched in VIA's MVP3, you can get K6-3 madness via the same BIOS update and mobo jumpers. It's a tough road core-logic chipset makers have to travel—you don't want to alienate your buyers, but at the same time, you don't want to fall behind in the features department. In order to introduce new features, you have to introduce a new mobo.

Hey, maybe mainboard makers need to come up with some type of easy-to-upgrade ZIF socket interface for core-logic chipsets!

## Track Star

As a professional in the field of computer products, I must insist that you revive the Tracking Sheet. This handy roadmap to the future was a great time saver for me, and I don't feel you have the right to pull this without a vote. So, all in favor of the Tracking Sheet being included in the magazine, say Aye. "Aye!" All opposed. "..." There it is, all nice and democratic, the ayes have it. So get the facts and get them into next month's edition.

*—Doug Wordsworth*

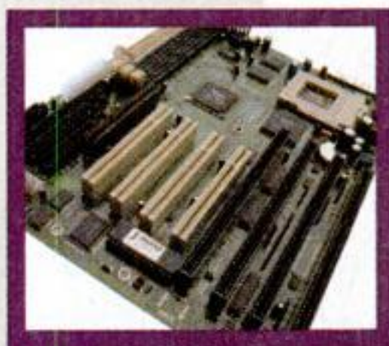
**Software Editor Rick Popko replies:** Doug, your wish is our command. We'll be putting the Tracking Sheet online and updating it regularly. Check out **www.maximumpc.com**.

## Making a Good Case

In your Dream Machine 98 feature (September 1998), you chose the Addtronics server case. I went to the URL listed and found more info on Addtronics' line of computer cases. I'm very interested in getting an Addtronics case, but I haven't been able to find any retailer, online or not, that carries Addtronics cases. I was wondering if you could provide me with a list of retailers, preferably online or mail-order, that carry Addtronics cases.

*—John Tsang*

**Online Editor Gordon Ung replies:** Try SuperMicro (**www.supermicro.com**) at 408.895.2000 in San Jose, CA. Its SC-750 is a re-marked Addtronics. In New Jersey, visit Antron (**www.antron .com**) at 800.998.0639. Also check under Addtronic's contacts section for other dealers in the United States.



"Everyone preaches the virtues of buying a good motherboard, but why bother? You'll just get screwed by the manufacturer when the time comes to upgrade your machine."

## A CPU's Got To Know Its Limitations

I keep reading about how the Voodoo$^2$ chipset is processor-limited and needs at least a Pentium II–class processor to achieve its full potential. Is the same statement true for all the PCI-based 2D/3D solutions out there, e.g., Banshee, TNT, and 740i-based boards? I'm sure many hapless sods like me are barely getting by with a P200 MMX system

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equipped with a first-gen Matrox Mystique 220 and Diamond Monster (Voodoo) board. It looks like it'll be a year before I can scrape up the ducats for a new system, so I'm looking for the proverbial "Cheap Fix" (skip the mobo replacement option) to rev my framerates. Yeah, *Unreal* and *SiN* will run on this rig, but the action can bog down when the polygonal alien innards start flying. For gaming, would an inexpensive upgrade like a Banshee card (or a PCI version of a TNT or 740i) offer any improvement? I've thought about springing for a dual-Voodoo$^2$ SLI setup and later migrating those boards to my next system, but I've heard that even the SLI config doesn't fly in a P200. True?

*—K Givens*

**Senior Editor Andrew Sanchez replies:** That depends on the videocard chipset. All the chips you've mentioned are engineered to work best with a P-II or better processor. Dual-Voodoo$^2$ SLI will give you more fps and higher resolutions than your current rig, but don't expect a massive performance increase. Expect more like 5fps or so with a new rig. i740 will actually be slower on your system than your current Voodoo, and you'll lose Glide support. TwiN Texel will work, but again, it's keyed for the P-II. I've heard folks get great performance gains by going with Banshee boards, but since it's based on a stripped-down Voodoo$^2$ architecture (which is heavily tweaked for P-IIs), don't expect too much. Banshee, like Voodoo$^2$, will give you a mild increase in performance.

Honestly, most of the new and upcoming video chips will be CPU-bound. That is, they will increase (or decrease) performance dependent on the CPU. Unless the videocard has some type of integrated RISC engine (such as Rendition's V2x00 series) or a front-end geometry engine, then videocards will continue this path of CPU dependence. If you do plan on going with a new videocard, you should seriously think of upgrading your CPU to a faster clock speed. Provided your mobo can handle it, teaming up a K6-2 350MHz or 400MHz with a Voodoo$^2$ can get your heart pumping again.

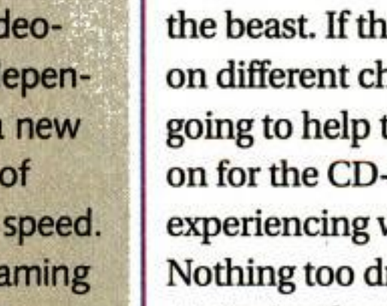
## Cell Your Modem

I'm in the market for a cellular modem to connect my Nokia 6160 to my JetBook notebook. Only problem is I don't have a clue about cellular modems, so I turn to my favorite magazine for help. Can you recommend a good cellular modem as well as tell me what else (if anything, i.e. cables) are needed and if there are any pitfalls associated with these modems.

*—Stephen Paul*

**Online Editor Gordon Ung replies:** To hook up your laptop, you'll need Nokia's NOK3 cable, $71.55, a DAR3 data adapter, $35, and a PC card modem.

Nokia recommends 3Com's XJ5560 or 3CXM556 modems. They run about $250 from most vendors. The pitfall with this configuration is the low bandwidth: about 9600 data rates. And since the phone only works in analog with data, you'll be prone to noise, shortened battery life, and of course the security issues. Analog isn't really the best choice for data connectivity, but it's your only choice unless you have a phone that supports Cellular Digital Packet Data (CDPD) or such protocol. You'll also pay through the noise in airtime. It's a fine setup, though, for short batch sessions of e-mail or browsing. If you want serious browsing all the time, look into a full-time CDPD PC card from vendors such as Sierra Wireless. It'll be cheaper and less prone to disruption. The 6160 is still one sweet cell phone.



"How dare these heathen individuals come together and put out such a shameful magazine."

## DMA + CD-ROM = headache

I recently read your article regarding DMA being switched on for a CD-ROM drive. I wouldn't do this, simply due to the nature of the beast. If the hard drive and CD-ROM are on different channels, there's no way DMA is going to help the hard drive by being turned on for the CD-ROM. But... I've recently been experiencing weird little slowdown periods. Nothing too drastic, but some occasional stuttering from the soundcard and video shaking once in a while. Just for curiosity, I checked the setting for my CD-ROM. Somehow, the DMA box was checked. The only thing I can figure is that something in a previous reinstall of Windows 98 must have gone awry. Anyway, your article fixed my problem by making me think to check something I never would have suspected.

*—David Ferrell*

**Technical Editor Sean Cleveland replies:** Enabling DMA on the CD-ROM drive is not going to make any difference with hard drive performance. DMA allows data to be written directly to memory without the need of the CPU. This is why DMA directly affects CPU utilization. In fact, if you watch a DVD movie on your computer via software decoding with DMA disabled on the drive, you'll almost be sure to notice dropped frames and even unsynched audio/video, even on a Pentium II 400. For hard drives, data rates are also affected, but to a lesser degree for ATAPI devices like CD-ROM drives. If you noticed that enabling DMA on your CD-ROM drive caused the anomalies you experienced, then by all means disable it. But it was most likely due to something else, such as outdated bus-master drivers, resource conflicts, or even hardware problems (motherboard or even the CD-ROM drive itself).

## Maximus JC

I'm writing in response to Maximum PC reader Jethro ("Is It A Sin...", Comm Port, January 1999):

I'm with you, man. How dare these heathen individuals come together and put out such a shameful magazine. Every time I open the pages or look at the cover, I feel the demon forces at work. I know if I read this thing for the third time, Satan will jump out of the pages and still my sacred soul. Why don't you and I start our own magazine? We could call it *Maximus JC*! All our articles would be limited to only the appropriate hard- and software. One section on MotherMaryBoards and another on sanctified soundcards. Do you suppose Orchid would mind a noncommittal review of its Righteous—Lord forgive me—Voodoo$^2$ card? If we could get our vendors and advertisers to sign a form stating their compliance with our religious beliefs, then we could sleep a little better knowing that we haven't contributed to the coffers of the ungodly.

Lastly, my puritanical brother, won't it be nice to have another pablum-spewing PC magazine lining the shelves? For all those other brothers and sisters not looking for honesty, but another medium that will pander to their own lack of self-confidence, we will have a magazine that exhibits our propensity to condemn those that dare not see it our way.

*—Wipeout*



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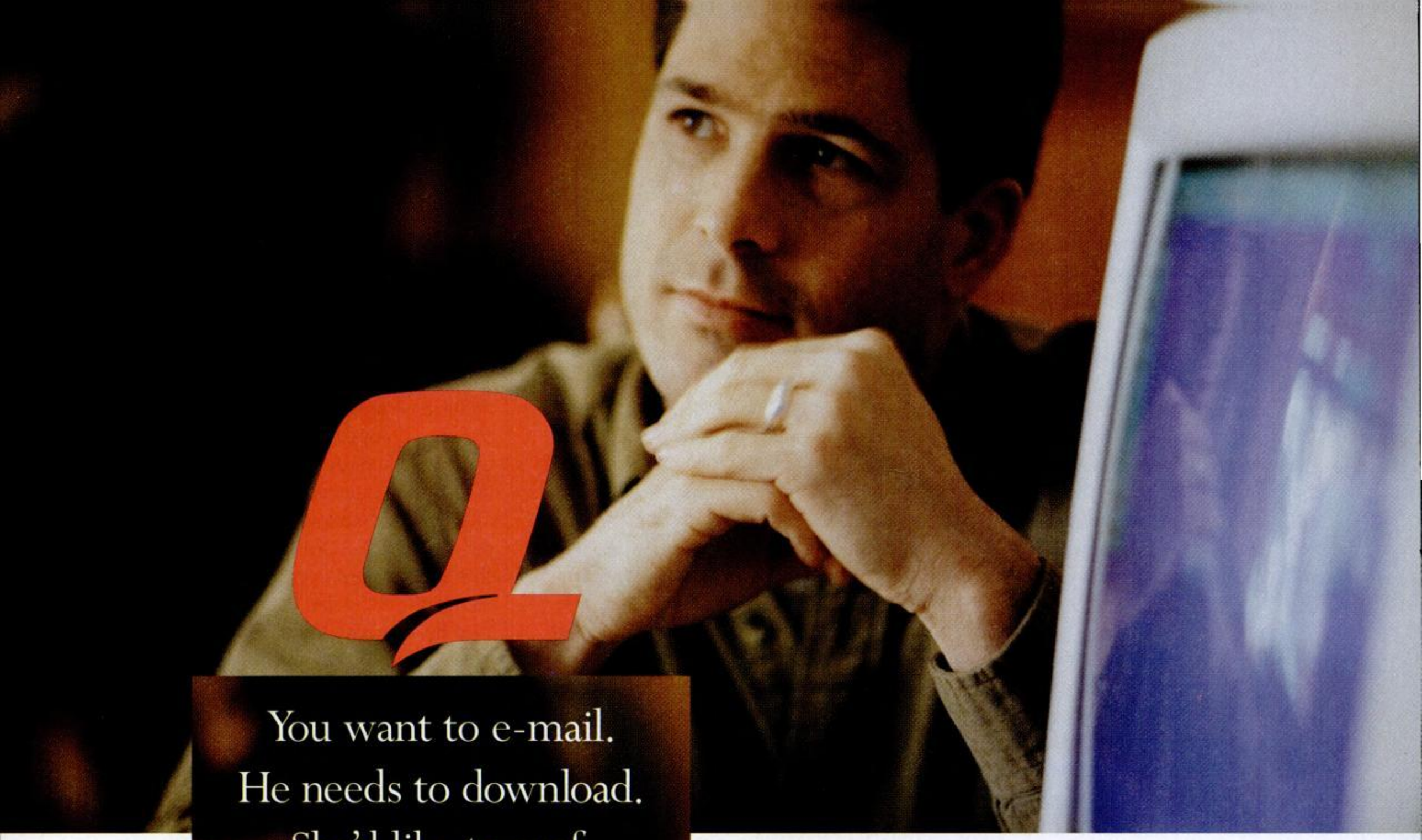

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July/August 1998 **FAMILY PC**
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August/September 1998 **WINDOWS MAGAZINE**
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Recommended Award • **PRESARIO 1640**

July/August 1998 **FAMILY PC**
Best Multimedia Notebook of the Year • **PRESARIO 1680**

April 1998 **LAPTOP BUYERS GUIDE & HANDBOOK**
BEST BUY Award • **PRESARIO 1621**

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| 13.3" TFT Active Matrix Display | 14.1" TFT Active Matrix Display | 14.1" TFT Active Matrix Display | 13.3" TFT Active Matrix Display |
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| 4.0 GB UltraDMA Hard Drive[1] | 6.4 GB UltraDMA Hard Drive[1] | 6.4 GB UltraDMA Hard Drive[1] | 24X Max CD-ROM Drive[3] |
| 2nd-Generation DVD-ROM Drive[4] | 24X Max CD-ROM Drive[3] | 2nd-Generation DVD-ROM Drive[4] | 64 MB SyncDRAM expandable to 128 MB |
| 256-bit Accelerated Graphics w/2.5 MB VRAM | 256-bit Accelerated Graphics w/2.5 MB VRAM | 256-bit Accelerated Graphics w/2.5 MB VRAM | 56K ITU V.90 Modem[2] |
| 56K ITU V.90 Modem[2] | 56K ITU V.90 Modem[2] | 56K ITU V.90 Modem[2] | 256-bit Accelerated Graphics w/2.5 MB VRAM |
| Smart Lilon Battery | Smart Lilon Battery | Smart Lilon Battery | Smart Lilon Battery |
| 256 KB Integrated "On-chip" cache | 256 KB Integrated "On-chip" cache | 256 KB Integrated "On-chip" cache | 256 KB Integrated "On-chip" cache |
| Microsoft Featured Home Collection | Microsoft Office 97 Small Business Edition | Microsoft Office 97 Small Business Edition | Microsoft Featured Home Collection |
| Microsoft Windows98 | Microsoft Windows98 | Microsoft Windows98 | Microsoft Windows98 |
| **$2,499** | **$2,999** | **$2,849** | **$1,999** |
| 6.4 GB UltraDMA Hard Drive:[1] Add $100 | 192 MB SyncDRAM: Add $250 | 192 MB SyncDRAM: Add $150 | 128 MB SyncDRAM: Add $200 |
| Extra Smart Lilon Battery: Add $129 | 2nd-Generation DVD-ROM Drive:[4] Add $149 | Briefcase Carrying Case: Add $119 | Briefcase Carrying Case: Add $119 |
| Tripp Lite 140 Watt Inverter: Add $49.95 | Port Replicator: Add $129 | Port Replicator: Add $129 | External Iomega Zip Drive: Add $149 |

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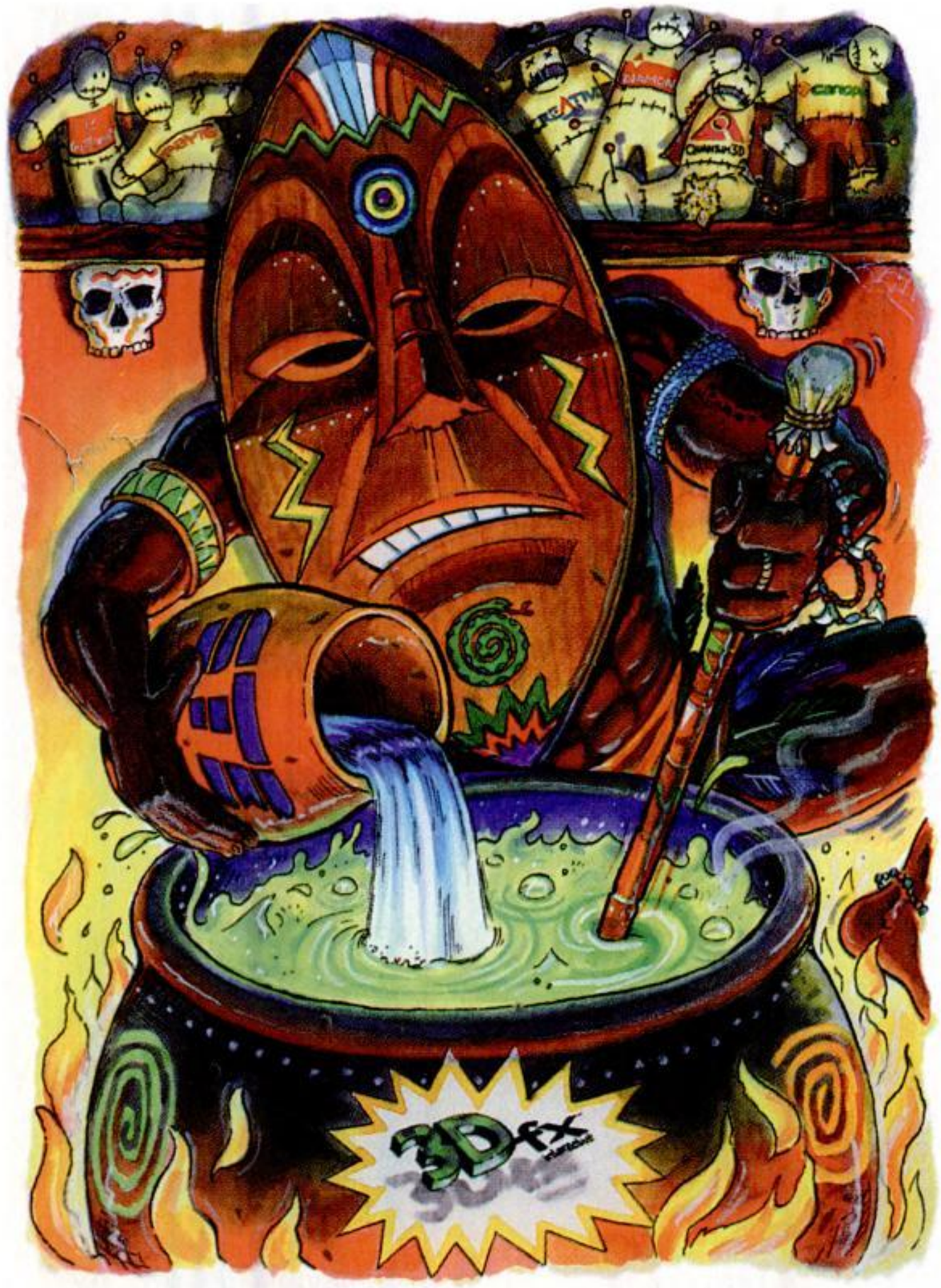
news ► 3D accelerators

# 3Dfx Hexes V³ Vendors

## Despite purchasing STB, company now faces even bigger hurdles




3Dfx practically stuck it to its retail partners, such as Diamond and Creative Labs, when it decided STB would be the only vendor to sell Voodoo³ cards.

When 3Dfx releases Voodoo³ later this year, the only vendor making boards will be STB. Prefer Diamond's bundle or Canopus's polished drivers? Too bad. Because when 3Dfx negotiated its $141 million acquisition of STB late last year [which at press time was still subject to the usual regulatory approvals], it pretty much flipped the bird at the retail partners and consumers that had helped make Voodoo a roaring success.

"Branding is critical to our overall success," said Michael Howse, 3Dfx's vice president of corporate marketing and business development. "But because most of our customers in the retail channel were shipping products with little or no differentiation, we were constantly at odds with them about how to brand the technology."

Try telling that to the thousands of consumers who were able to shop around for the best deal, compare software bundles, or patronize vendors—such as highly respected Canopus—that put a little extra effort into their drivers and hardware design. Not only has the deal eliminated retail competition, but as a result two companies—Quantum 3D and Canopus—are abandoning the retail market completely.

"We're concentrating on Quicksilver, our Intel-based, ruggedized arcade PC," said Peter Giordano, Quantum 3D's director of communication. "We don't have any retail products on the slate for 1999."

Jim Anderson, Canopus's vice president of sales and marketing, told *Maximum PC* the company is moving away from the retail add-in card market to concentrate on its professional digital-video-editing products.

By having only one Voodoo vendor, 3Dfx reckons, the company will be able to grab a piece of the lucrative OEM market (something that has eluded it in the past, primarily because the company didn't offer a mainstream 2D/3D product) and control the price.

"With Banshee, our customers were competing solely on price, making it difficult for the company to achieve the operating margin it takes to be successful," said Howse. "Seeking out a board manufacturer—STB in particular—provided a perfect opportunity to do that." Besides, says Howse, who makes the card isn't as important as who makes the chip.

"Consumers weren't buying Diamond and Creative Labs graphics cards because of the delivery vehicle," said Howse.

ILLUSTRATION BY SCOTT PECK

## SPIN CYCLE

This month's top stories broken down ►

| HEADLINE | NEWS | DETAILS | QUOTE | OUR TAKE |
|---|---|---|---|---|
| **Compaq Acquires Problem-Infected Shopping Web Site for $220M** | Compaq has bought shopping.com, a digital shopping site with over 1,000 merchants in 63 categories, including books, music, automobiles, travel, and phone services. | Compaq will integrate shopping.com with its Alta Vista search engine. No word yet as to what Compaq will do to beef up the site's notoriously bad customer service. | "We plan to turn shopping.com into a premiere shopping site and make Alta Vista the leading guide for both information and e-commerce," said Compaq's Rod Schrock. | Compaq or not, shopping.com has a history of slow to no product delivery and bad customer service. We wouldn't buy anything from it until it cleans up its act. |
| **Consortium Wants MP3 Replacement** | Major record labels and top technology companies have announced plans to create a new music format that is copyright-friendly for the Internet age. | The Secure Digital Music Initiative would placate record labels that fear losses to piracy and give tech companies clear sailing to make Internet music products without harassment. | "It is Diamond's intention to support an industry standard that allows all musicians to use the Internet to distribute their music," said Diamond's Ken Wirt. | Yet another initiative to destroy something that's already widely accepted by consumers. |



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"They were buying them to get the 3Dfx technology inside."

"The ironic thing about the deal," said Ken Wirt, Diamond's vice president of marketing, "is that 3Dfx gave up its top two customers in the retail space, and STB gave up all its OEM nVidia business." Wirt says that going it alone—albeit as a newly combined entity—will be a major challenge to 3Dfx's mainstream aspirations. "If they try to replace the volume that Diamond and Creative did together, we're talking a lot of infrastructure, which they don't have," he said, citing such headaches as tech support, product returns, and retail vendor support. In a true global market, Wirt asserts, there's no such thing as price control. "Saying you want to have control over pricing and margins is a euphemism for saying you can sell your products for a higher price," he said. Cracking the tightly contested OEM market won't be a piece of cake either, since OEMs prefer to deal with one vendor that can supply the chips for several product lines.

But while 3Dfx pins its hopes on Voodoo$^3$, which Howse says will "deliver the best end-user experience—period," the reaction from vendors and consumers so far has been lukewarm at best.

**"Consumers weren't buying Diamond and Creative Labs graphics cards because of the delivery vehicle. They were buying them to get the 3Dfx technology inside."**

*—Michael Howse, vice president of corporate marketing and business development, 3Dfx*

"Is Voodoo$^3$ the best product ever?" asked Seogju Lee, research analyst at International Data Corp. "It's doubtful." Both ATI and nVidia have next-generation parts with comparable or better performance, he said, and it will be difficult for 3Dfx to unseat ATI and nVidia, both of which offer deeper product lines at strategic price points.

Parth Shukla, Guillemot's product manager, is more succinct: "Voodoo$^3$ has a number of defects." Those defects, which have also been debated in countless newsgroups and on 3Dfx/Voodoo fan sites, include a 16MB memory limitation, no AGP direct memory execution, and a maximum 256x256 pixel texture size. Even id Software's John Carmack doesn't seem all that impressed.

"It will definitely not offer the best visual quality because it lacks 24-bit rendering," Carmack said, referring to his upcoming multiplayer game *Quake Arena*. "If it lives up to its specs, it may be the fastest 16-bit color card."

"What really matters is framerates," counters 3Dfx's Hawse, who classifies the aforementioned features as "interesting" but warns of significant performance penalties. "Those features are only important if the game is actually playable at 60fps. When you see those technologies implemented in our products, it will have some end-user relevance, and you won't have to take a performance hit."

Clearly, the company that stands to lose—and gain—the most is nVidia. STB was one of nVidia's biggest customers, and although it'll hurt to lose the business, the slack will likely be picked up by Diamond and Creative Labs, among others.

Diamond's Wirt agrees, saying he expects nVidia technology to become a staple in Diamond's products this year. "The only reason 3Dfx is releasing Voodoo$^3$ is to fund development of Voodoo$^4$," he suggested. "To do the next generation they'll need a lot of money, and one way to make more dollars and profit is to be in the board business."

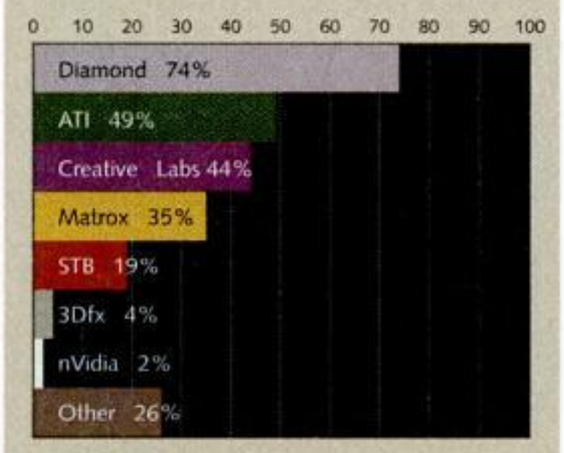
Making more money is essentially what this deal is about. But Canopus's Anderson warns that making it work might be too big a challenge for both 3Dfx and STB. "Everything is going to ride on how good Voodoo$^3$ is compared to TNT2," he said. Anderson doesn't think Voodoo$^3$ is the technology to beat this year, but said if they pull it off, it'll be a stroke of brilliance. "However, if 3Dfx fails to deliver," he warns, "it'll turn into the next S3."

## What's in a name?

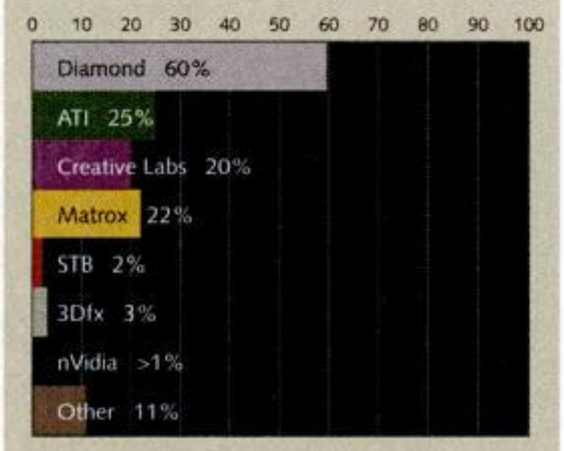
3Dfx is banking on its name to become the dominant supplier to the retail and OEM markets. But is the 3Dfx name really as strong as they think?

In a nationwide survey, Fairfield Research asked 500 PC owners a number of questions regarding graphics technology. The following two questions were commissioned by Diamond Multimedia:

**What companies come to mind that make gaming-oriented 3D graphics boards for PCs?**




**What brand of graphics board would be your 1st or 2nd choice (in a new computer)?**




Source: Fairfield Research HomePC TRAK nationwide sample of 500 respondents, fielded Q3 98.

to the pertinent details.

26

| HEADLINE | NEWS | DETAILS | QUOTE | OUR TAKE |
|---|---|---|---|---|
| **Apple Licenses OpenGL; John Carmack Pledges Support** | Apple has licensed SGI's OpenGL API and software library, and will incorporate OpenGL into future versions of the MacOS, starting with the next release of MacOS 8. | Carmack has pledged simultaneous releases of *Quake Arena* on both the PC and Apple platforms—a first for id Software and a major win for Apple. | "Game developers told us what they needed to make Macintosh the best gaming platform, and OpenGL was at the top of their list," said Steve Jobs, Apple's interim CEO. | Face the facts. The majority of games aren't programmed to use OpenGL. Compared to the PC, the Mac will still be a lousy platform for hardcore gamers. |
| **@Home Subscribers' Complaints On The Rise** | During 1998, the struggling cable modem provider saw its subscriber base jump from 50,000 to 330,000, a 660% increase. | @Home has been plagued by reports of sporadic service, technical glitches, and lousy customer service, especially in the San Francisco Bay and Hartford, Connecticut, areas. | "The increase in our subscriber growth reflects the pent-up demand for broadband Internet services in the wider residential market," said @Home's Tom Jermoluk. | @Home's recent backbone deal with AT&T may help eliminate capacity constraints, but some consumers are considering filing a class-action complaint. |



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# Intel Blocks P-III Overclocking

## But workarounds exist

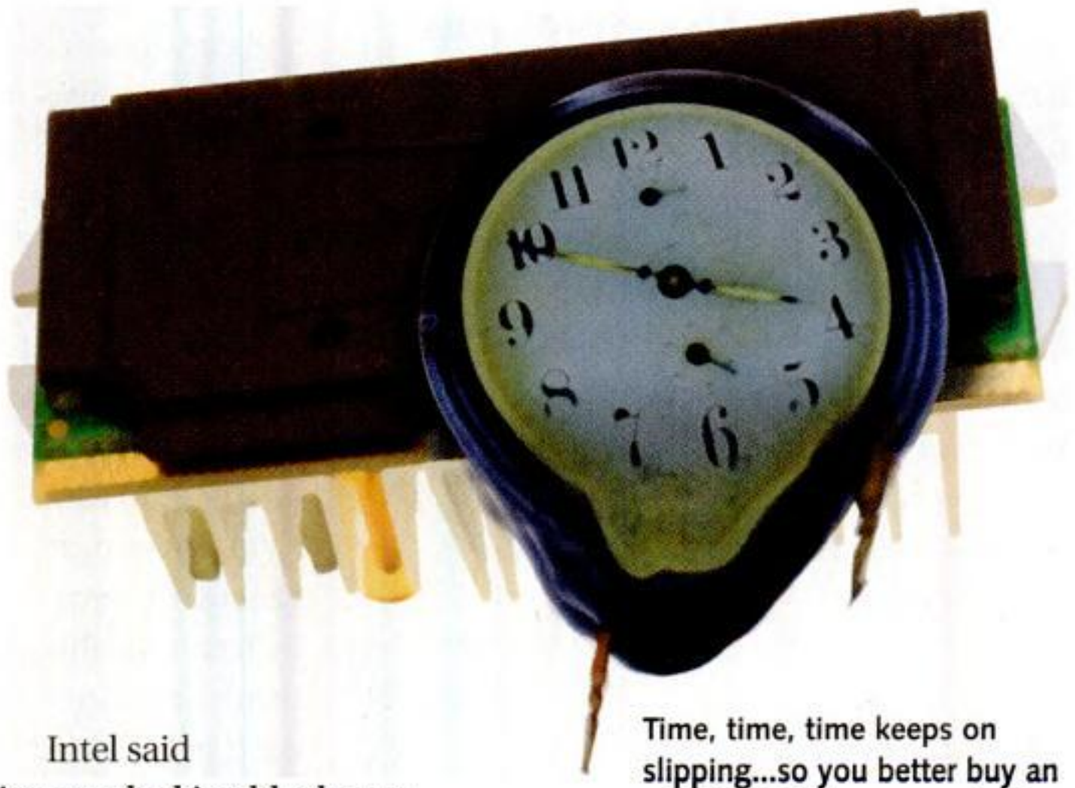
New Pentium III processors will ship with a block that prohibits system-bus overclocking, according to reports posted on the Internet and information gleaned directly from Intel. This system-bus block follows on the heels of a multiplier overclocking block, which Intel instituted during the end-run of its Pentium II line.

Intel has demurred in providing any technical details on the new system-bus block, opting for silence to keep CPU hackers guessing. Said one representative: "It's clear that there are new protections in the Deschutes [0.25-micron fab process] family... But if there is a way around it, there's a good chance hobbyists will find it."

In fact, hobbyists may not need to look far for a block override. In our own testing, we successfully overclocked a 500MHz Pentium III to 515MHz by going into the motherboard BIOS and upping the system-bus speed from 100MHz to 103MHz. However, that processor was an engineering sample hand-delivered to us by Intel and may differ from final production parts.

CPU reporter Tom Pabst of Tom's Hardware Guide (**www.tomshardware.com**) reported that new Pentium III and socketed Celeron processors will include circuitry that checks the system-bus clock, and if the clock exceeds a specified limit, the CPU will shut down. Assuming Pabst's explanation is accurate (Intel declined comment), and assuming final Pentium III shipping models do in fact deny system-bus overclocking, we can only assume the hard-coded anti-overclocking circuit can somehow be flipped off with the right tools—intellectual, electrical, mechanical, or otherwise.

**"Hot-rodders will continue to overclock, but we don't recommend it. The part may not perform as expected or fail entirely"**
*—Intel representative*



Time, time, time keeps on slipping...so you better buy an overclockable processor before Intel clamps down.

Intel said its overclocking blocks are intended to discourage re-marking fraud, and the company is much less concerned with individual users who knowingly endanger their own hardware in the quest for higher performance.

"The hot-rodders will continue to overclock, but we don't recommend it," said the Intel representative. "The part may not perform as expected. In worst cases, the part can fail entirely." Intel says the major problem is with unscrupulous vendors defrauding innocent consumers, and that its overclocking protections are just part of a larger program against fraud.

Still, Intel says that relatively few people actually melt their CPUs as a result of overclocking. "The more common thing we see is the erosion of long-term reliability," he said. "The materials change over time when you run them under excessive heat. And, with applications, you can't tell if the applications are running correctly or not, even though the application may not fail entirely."

At press time, AMD said it has never instituted overclocking blocks in its CPUs, and has no plans to do so in the future. On page 73, we preview the KryoTech system, which includes an AMD-approved cooling mechanism that chills a 400MHz K6-2 overclocked to 500MHz.

A detailed report on Pentium III processors begins on page 62. Keep reading *Maximum PC* for more information on Pentium III overclocking blocks, and be sure to check out this month's Watchdog column (on page 29) for an update on consumers falling victim to re-marking fraud.

## SPIN CYCLE

◀ 25

| HEADLINE | NEWS | DETAILS | QUOTE | OUR TAKE |
|---|---|---|---|---|
| **Intel, S3 Sign Patent Deal** | Intel and S3 have signed a 10-year, cross-license patent agreement to create semiconductors and graphics processors that utilize each other's patented technologies. | Intel granted S3 a bus license for current and future Intel general-purpose processors. S3 will incorporate more functionality onto its accelerator chips and pursue new markets. | "Through this agreement, S3 intends to re-establish its position as the number-one supplier to high-volume OEMs and add-in-card manufacturers," said S3's Ken Potashner. | Not with Savage3D it won't. Nonetheless, the deal demonstrates Intel's desire to cross-pollinate with S3 and core-logic chipset manufacturers such as Via Technologies. |
| **Intel Ups Celeron Speed, Cache** | Intel's much-maligned Celeron processor has received a much-needed makeover to the tune of two new clock speeds—366MHz and 400MHz—for both sockets and slots. | The long-awaited socketed Celeron interface is called Plastic Pin Grid Array (PPGA) and is supported by a new core-logic chipset, the Intel 440ZX. | "These are the first of many new low-cost PC desktop and mobile products from Intel in 1999, and will help reinforce Intel's leadership worldwide," said Intel's Paul Otellini. | Celeron is more at risk than ever before, especially since AMD is readying its 450MHz K6-3, which will have 256K of on-die, L2 cache compared to the Celeron's lowly 128K. |



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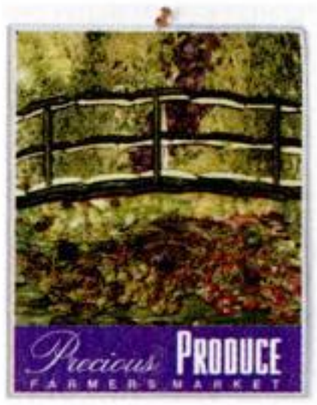
YOU'VE GOT TO SEE IT IN **EPSON** COLOR.

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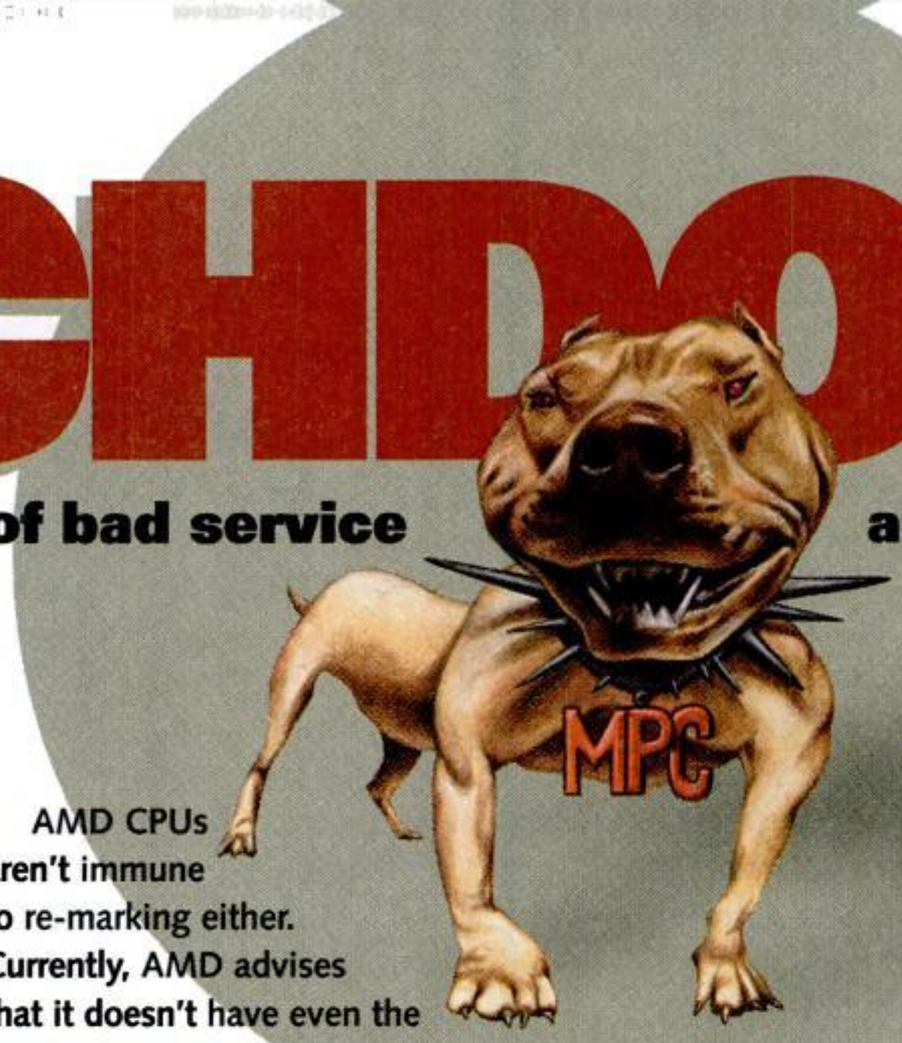
# WATCHDOG

**▶ Maximum PC takes a bite out of bad service and gear**

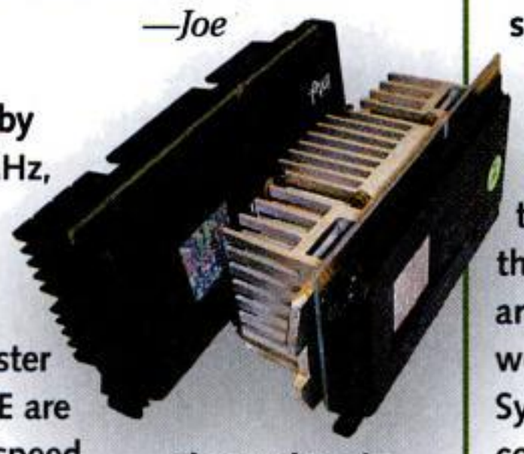



## 450 OR NOT?

**DEAR DOG** I bought a new PC, and my certified Intel vendor offered me a good deal on 450MHz and 500MHz Pentium II chips. He said he got a special deal from **INTEL** on these chips, and they were in sealed P-II 300MHz and 333MHz boxes. He explained that Intel had run out of 300MHz and 333MHz chips for these boxes due to demand and substituted 450MHz and 500MHz chips instead. These new chips were physically different inside. They ran with a core voltage of 2 volts instead of 2.2 to 2.8 volts. The number of cache chips was reduced from four 128K chips to two 256K chips. The Intel boxes were marked with a special tag (SL2WY).

I know 500MHz chips aren't released yet, but I purchased a 500MHz chip. When I boot up, the screen tells me it's a 500MHz chip. The only time Windows 98 crashes is on the occasional demo games. I'm told I'm still covered by Intel's warranty. Do I have an overclocked Celeron or the real thing, and is there a test I can run to tell me?

*—Joe*



The authentic 500MHz P-III looks very different from an overclocked P-II.

**THE DOG** bets a case of Scooby Snacks that it's not a real 500MHz, but a re-marked chip. What's a re-marked chip? It's a slower chip whose cartridge has been altered to make it look like a faster CPU. Only Pentium IIIs with SSE are available in the 500MHz clock speed from Intel, and their cartridges are significantly different from Pentium IIs. It's also definitely not a Celeron because of the presence of 512K L2 cache. The SL2WY is the marking for a 333MHz Pentium II, of course.

Run c't magazine's utility, ctP2Info.exe, located on the Maximum CD. Write down the type, family, model, and stepping. Re-markers can't change these (as far as we know). It should resemble a sequence of 0-6-5-1. Also, jot down the serial number from your CPU and the SL number. Search Intel's site (**www.intel.com**) for your CPU's SL number or check the list located at **www.sandpile.org**. Your info should match what your cartridge says is inside. If it doesn't, contact Intel's fraud line at 800.628.8686. Intel will want your serial number and to know who and where you bought your CPU from.

Even if your machine passed with flying colors, you shouldn't smile. Clever re-markers have been known to use the correct SL spec. Thus, a 333MHz SL2WY P-II will return the same internal information as a 450MHz Pentium II SLU2.

The best advice is to buy a boxed CPU from a reputable vendor. The keyword here is reputable, as the above reader said he bought his boxed CPU from a certified Intel vendor. It just wasn't in the right box.

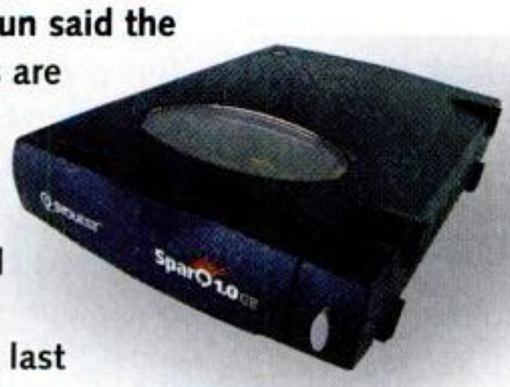
AMD CPUs aren't immune to re-marking either. Currently, AMD advises that it doesn't have even the minimal tests that Intel has now. Exercise caution and good judgment, and don't let the low price influence you. Unscrupulous vendors know people's urge for a bargain often clouds good judgment.

## SYQUEST UPDATE

The Dog just held a mirror to SyQuest's face and surprisingly there are signs of life despite the company's bankruptcy and pending sale of assets to competitor Iomega.

SyQuest spokesperson John Chun says the company is offering limited support and service. Check SyQuest's site, **www.syquest.com** for pricing on out-of-warranty repairs. In-warranty repairs will be handled for the cost of shipping and handling.

For the dozens of Maximum PC readers who had their drives locked up while SyQuest reorganized, there's good news. Chun said repairs and replacements are expected to be returned within 60 days if all goes well. If you haven't received your drive by now, contact SyQuest by e-mail at **info@syquest.com**. Chun said the company has detailed records on whose drives are in for repair. If you're worried about your warranty through this year, Iomega has graciously allowed SyQuest to use remanufactured drives and drives returned from the retail channel for warranty and service work.



SyQuest SparQ

Chun estimates they have enough drives to last for a while and enough media to satisfy customers for at least a year. Those who are owed rebates are out of luck, however, and must apply as creditors of the court. File your claim with the same court in the JTS bankruptcy below.

## JTS PERMANENTLY CRASHED?

If you've followed the problems Maximum PC readers have had with **JTS** drives and customer service, you won't be surprised to hear the company's heads may have finally hit the platter one too many times. Reader Susan Vasquez bird-dogged this info from the Santa Clara County DA's office:

**According to the company's lawyer, JTS drives in for repair will be considered in the bankruptcy plan.**

ILLUSTRATION BY SCOTT LAUMANN



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**"The attorney for JTS Corp. has suggested that customers should file a proof of claim form. The case number is 98-59752-ASW-11. The completed form should be returned to the U.S. Bankruptcy Court, Northern District of California, 280 South First Street, San Jose, CA 95113. The attorney is aware that several customers have drives in for repair and has indicated these will be considered in the bankruptcy plan."**

JTS hard drive

**THE DOG is in contact with the attorney handling JTS, but at press time no new information was available. Well keep you up to date here or on maximumpc.com.**

# CLICK OF DEATH KNELL

**THE DOG managed to slip some questions into Maximum PC's Interrogation of Iomega exec Ted Briscoe (see page 42) concerning the controversial "click of death" syndrome some Zip drive owners have experienced. Here's Iomega's response and possibly the first answers outside the corporate line that everything is OK.**

**"I'll be the first to admit that's not a very user-friendly way to support someone who has likely just spent a hundred dollars or more to purchase your products."**

*—Ted Briscoe, Iomega*

**MAXIMUM PC We visited the "click of death web site," an independent site run by disgruntled Iomega users. The site poses three questions, which we thought we'd ask you to answer today.**

**BRISCOE** OK. Shoot away.

**MAXIMUM PC The first one was, "Why is it that many consumers report this problem within one month rather than the first day of ownership?"**

**BRISCOE** There are clicking sounds associated with normal operation of the drive. A lot of people think they've got problems because of a clicking sound and it turns out there are no problems at all. But with most PC hardware, failure is generally going to occur within the first 30 to 90 days. Those statistics speak for themselves as to when they occur, so that shouldn't be a surprise.

**MAXIMUM PC OK. The next question was, "Why doesn't Iomega offer e-mail technical support?"**

**BRISCOE** We do offer e-mail technical support. You can post questions and get answers. We've had that in place for the last two or three years.

**MAXIMUM PC But does Iomega offer technical support via personal e-mail?**

**BRISCOE** Yep. We have leveraged support tools that include postings to bulletin boards. You can find the answers to the most common problems, or you can submit a question and wait for an answer back either in e-mail or on the bulletin board.

**MAXIMUM PC The "click of death" site also claims that "Iomega doesn't provide technical support without first asking for your credit card." Is that true?**

**BRISCOE** Unfortunately yes. But that's changing. Three years ago, as we were going through explosive growth, one of the issues we were dealing with was how to provide the right level of support to our customers. One thing that popped up was moving to a fee-based support system, not for Iomega-caused problems, mind you, but for problems that people would encounter because of a unique configuration with a soundcard or something that was causing a hardware conflict. We've never charged for support for problems that are caused by our hardware or some issue with our software or a missing cable or anything like that. But we did move to a model where we were charging for problems that were caused because of a unique customer issue or because customers chose not to read the manual first.

This has not turned out to be a good decision. It's not a big revenue generator for us, and it really doesn't deter any calls from coming in. During the last year, we've been evaluating the appropriate next steps on how we can move forward and find a way to provide support without creating the problems associated with fee-based support.

**MAXIMUM PC So if we called up your technical support department, would we be asked for a credit-card number before receiving any assistance?**

**BRISCOE** I think from a process standpoint they do ask that right up front, but you aren't necessarily charged anything. I'll be the first to admit that's not a very user-friendly way to support someone who has likely just spent a hundred dollars or more to purchase your products. We acknowledge that. It hasn't been implemented well. The intent was pure, but the process hasn't worked and we're moving beyond it.

**THE DOG gave Jatin Billimoria, creator of the unofficial "click of death" web site (www.thirdeyesp.com/isage/iomega/), a chance to rebut Briscoe.**

**BILLIMORIA** It seems that Briscoe is spinning the question around about e-mail support. Although Iomega may respond to some users by e-mail, there isn't a direct e-mail address for technical support. Many other major computer-related companies provide that necessity. And even though Iomega provides a bulletin board to Iomega consumers, it is only available to those who are members of America Online. Basically, Iomega expects users to become members of AOL just to get basic electronic-based technical support.

**With the question about direct e-mail up in the air, THE DOG contacted Iomega officials who said direct e-mail to technical support would be made available later this year. Iomega does continue to warranty drives that die from the "click of death," even outside of warranty periods. Let's just hope the e-mail address isn't clickofdeath@iomega.com. Woof.**

---

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# ABC to Y2K

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**by Frank Boumphrey, et al**

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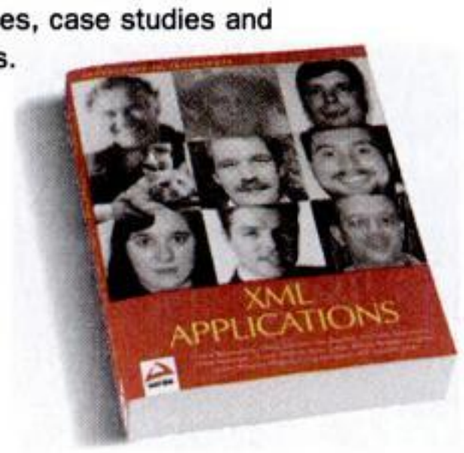


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**by Bruce F. Webster**

The co-chair of the Washington D.C. Year 2000 Group assesses the potential impact of Y2K and offers crisis management strategies for protecting yourself personally and professionally. Learn which industries are most at risk, how to Y2K-proof your home and assets, and what to expect in the future. (PTR)

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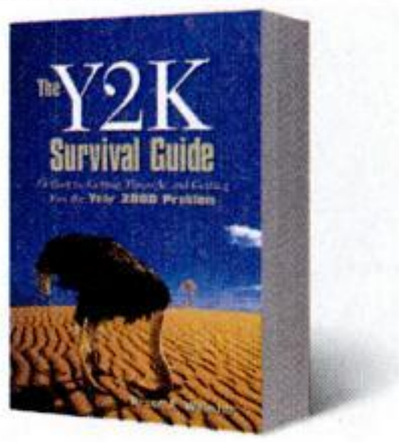


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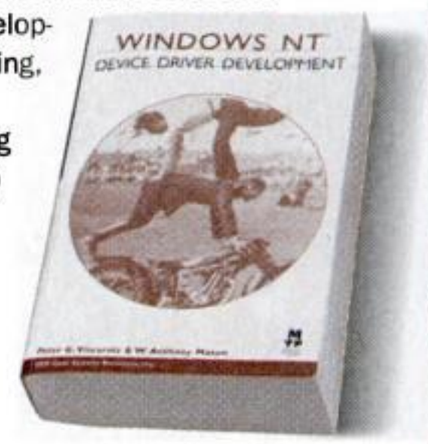


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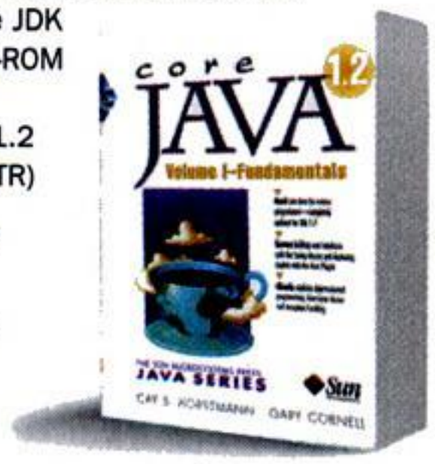


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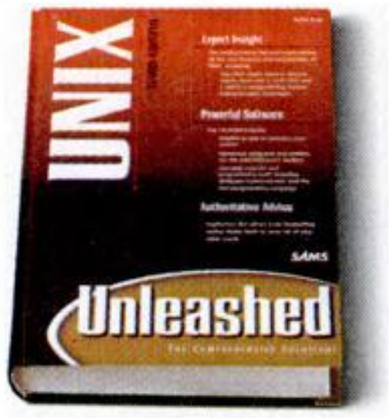


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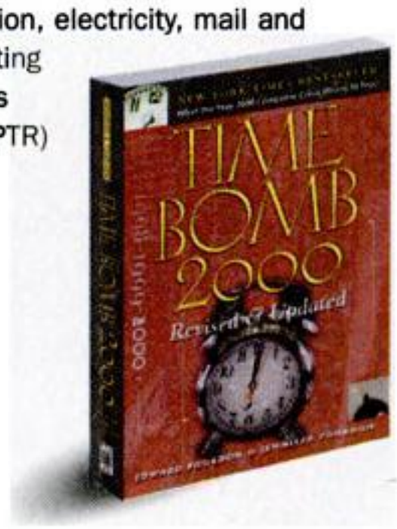


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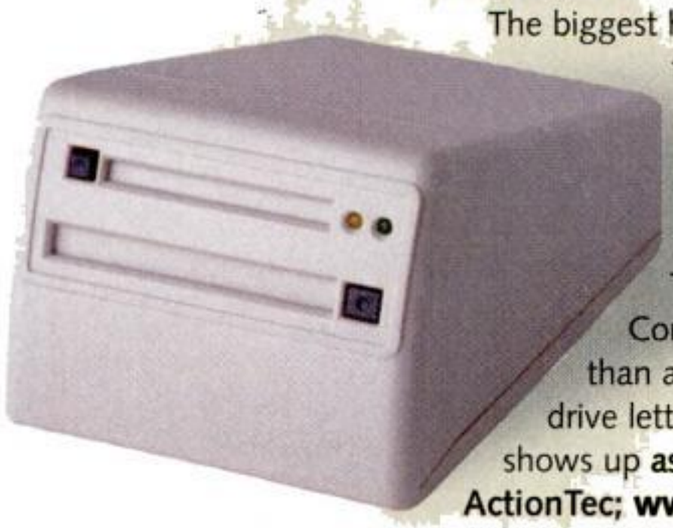

The biggest hassle with digital cameras is getting your pictures from the camera to the computer. Attaching serial cables requires climbing under your desk, and sucking pix down from the camera puts you at the whim of proprietary software and fickle TWAIN drivers. When a connection is finally made, you have to suffer through molasses-slow transfer times.

ActionTec's $119 CameraConnect Pro solves all these problems. This external drive attaches to your PC's parallel port and reads CompactFlash, SmartMedia, and Flash PC cards up to 50 times faster than a serial port connection. The CameraConnect Pro automatically takes a drive letter and maps the contents of each hot-swappable card so that the data shows up as native files that you can copy, edit, and delete directly from the card.

**ActionTec; www.actiontec.com; 800.797.7001**

## Vadem Clio

The sophisticated lines of Vadem's Clio combine a nigh full-sized keyboard with a 9.4-inch color touchscreen in a clever flip-and-fold design that takes it from notebook to notepad with innovative ease. Weighing in at 3.2 pounds and encased in a magnesium and plastic case, the Clio is more than just a fancy PDA gymnast. It's a powerful Windows CE Professional device packed to the gills with Microsoft *Pocket Office*, *Pocket Outlook*, *Pocket Internet Explorer*, and BSQUARE *bFAX Pro*. The real star of the Clio bundle, however, is Paragraph's *Calligrapher* software, which finally takes Windows CE handwriting recognition out of the dark ages.

The $999 Clio includes an NEC VR4111 MIPS processor and comes equipped with 16MB of RAM, a 33.6 modem, and a lithium ion battery for a solid 10 hours plus of power. For on-the-go folks who think notebooks are too big and palm PDAs too small, the Clio could be just right. **Vadem; www.vadem.com; 888.468.2336**

**While the keyboard isn't full-size, the keys are big enough to avoid the finger-cramping problems of other PDAs.**

**The Clio's big on flexibility, and its aerobics routine includes a turn as a digital writing tablet.**

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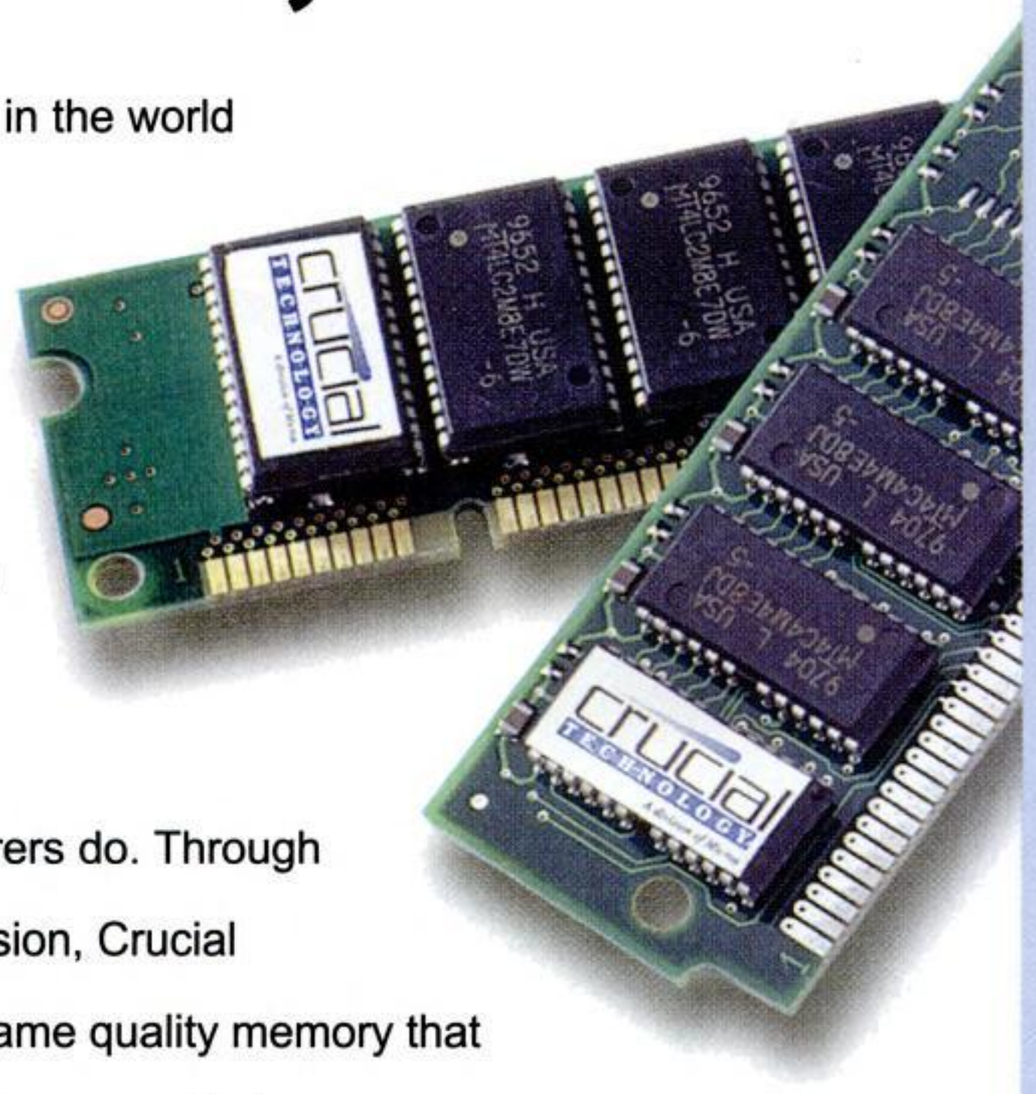

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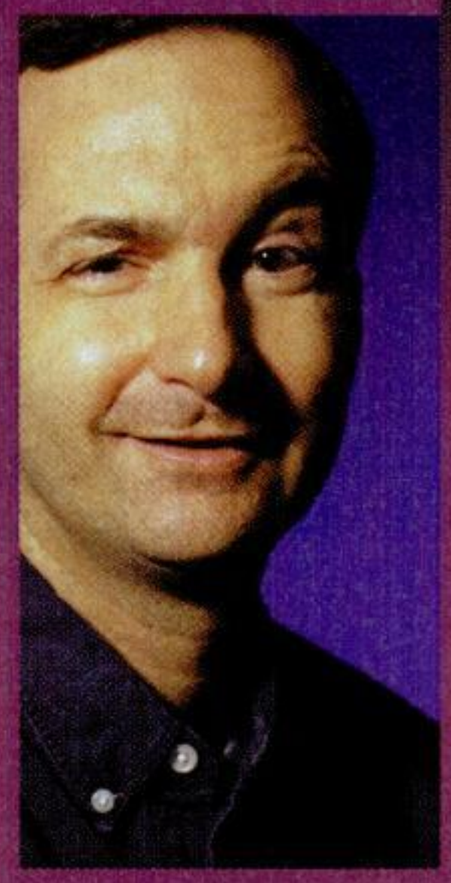

**TOM HALFHILL**
was senior editor at Byte magazine and is regarded as one of the most knowledgeable experts on processor technology in the industry. Contact him at **thalfhill@maximumpc.com**

# The Two Faces of Microsoft

## A VETERAN TECH REPORTER WEIGHS IN WITH A VERDICT IN THE LANDMARK CASE

Bill Gates should get down on his knees and thank providence (or at least the Republicans) for making his antitrust case only the *second* most famous trial of the year.

Uncle Sam versus Microsoft is truly a landmark case. The U.S. Justice Department charges that Microsoft is engaging in monopolistic behavior by integrating *Internet Explorer* into Windows and by undermining Sun's cross-platform Java standard. Microsoft says that integrating a web browser into an operating system is simply a logical evolution of technology, and that optimizing Java to run on Windows isn't a plot to eclipse Sun.

Is Microsoft right or wrong? Yes.

Microsoft is right that integrating the functions of a web browser into an operating system is logical. Microsoft is wrong that tinkering with Java's cross-platform compatibility isn't sabotage—whether or not it violates the letter of Sun's Java license.

Let's start with the browser battle. It should be obvious that network connectivity is one of the most significant trends in computer technology—perhaps even the *most* significant trend. Computers become enormously more useful when they're networked. And the biggest network of all is the Internet.

When you're on the net, every server is like another disk drive attached to your system. It may not feel that way if your net connection is slow, but that's just a matter of waiting for bandwidth to catch up with demand. It will. If your computer is on a local area network (LAN) or has a "live" (always available without dial-up) connection to the Internet, you know what I mean. You can access disk drives on remote servers as easily as disk drives on your local system. Indeed, modern operating systems display those remote drives as icons on the PC desktop, so a casual user might not even distinguish between local and remote resources. You can freely drag and drop files no matter where they are. It's seamless.

Would it make sense to run a different program to access remote drives on a LAN? Of course not. If there's enough bandwidth between your PC and the server, the physical distance disappears, even if the server is miles away. The sum of local and remote resources available from your computer is your virtual file space. Before networks, your file space was limited to whatever was inside the metal box of your PC. Now it's global.

Microsoft isn't the only company to recognize this. Everyone is integrating network connectivity to create a seamless desktop experience for users. In 1997, I wrote a lengthy article identifying 13 operating systems or desktop "shells" that were clearly moving in this direction. And that includes products from all of Microsoft's major competitors: Sun, Netscape, IBM, Oracle, and Apple. Merging the functions of a web browser with an operating system is logical, evolutionary, and consistent with historical trends. Microsoft is merely following the crowd.

However, Microsoft's war on Java is harder to justify. While Microsoft shakes its fist at Sun's claims of "write once, run anywhere," Microsoft's left hand is rolling barrels in Java's path. The truth is Microsoft is terrified that Java will succeed. If Java were as flawed as Microsoft claims, it would have died by now, *without* Microsoft's help.

Some of Microsoft's tactics are comical. For instance, Microsoft says Java's cross-platform compatibility is an empty promise, more like "write once, test and debug everywhere." Duh! That's true of all software. How can Microsoft attack Java for requiring testing and debugging on completely different platforms when Microsoft has to test and debug its own software on minor variations of a single platform?

Microsoft says it's only trying to improve Java's performance on Windows, and if that makes "Windows Java" incompatible with Sun's Java, who cares? OK, consider this scenario. Let's go back to the 1980s, when an immature platform called Windows was struggling for acceptance. Suppose one of Microsoft's biggest licensees—say, Compaq—modified Windows to run better on Compaq PCs, but those changes made it incompatible with the standard version of Windows. Now there's Compaq Windows and Microsoft Windows, each requiring different software. Would that be a good thing for users and developers? Would Microsoft ignore it, or haul Compaq's butt into court? I think you know the answers.

As a technology journalist and a computer enthusiast, I want to see a court decision that makes technical sense, not just legal sense. Let's hope we get both. ✹

**Merging the functions of a web browser with an operating system is logical, evolutionary, and consistent with historical trends. However, Microsoft's war on Java is harder to justify.**



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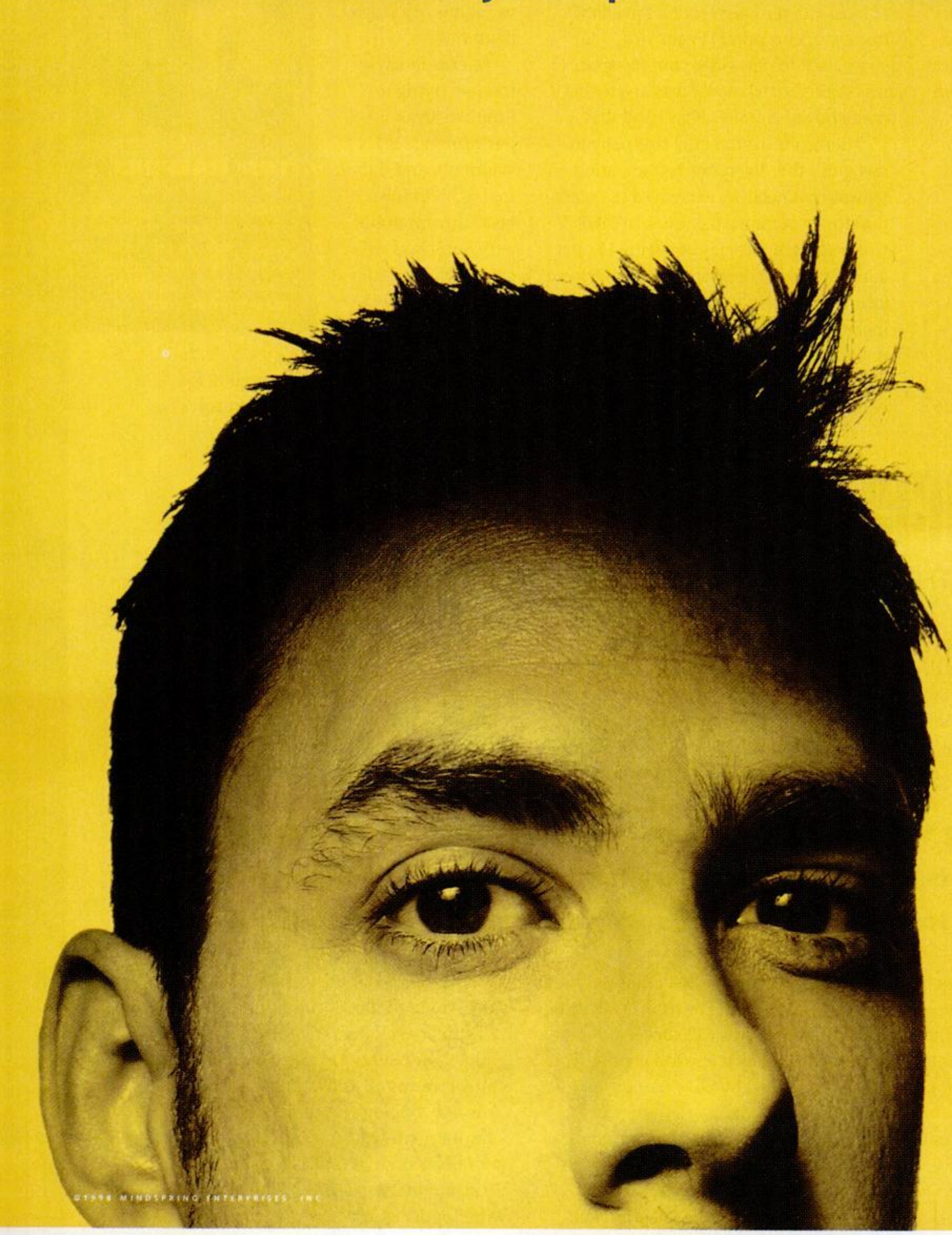

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# ON THE LINE

**SHEL KIMEN**
has worked in the industry, traveled the world, and covered the Internet for both The Net and boot magazine. She can be contacted at **skimen@maximumpc.com**.

# December 16, 1998, 5:22 p.m. ET

## THE DAY THE INTERNET BECAME A NECESSITY TO ME

On December 16, 1998, at 5:22 p.m. ET, I got an e-mail that said, "Turn on the television, we are bombing Iraq." I was at work and didn't know if we even had a television. So, I pointed my browser to CNN.com and waited 10 seconds to get access over the T1. At 5:23 P.M. I saw the front page headline "U.S. Strikes Iraq," so I continued to read. Halfway through the article I spied a RealVideo link. I fired up the G2 just in time to see fluorescent green night-vision explosions on my PC. Just in time to hear a U.S. defense department spokesperson stumble through a ridiculous and offensive media alert. Just in time to witness CNN's mega-servers grind suddenly to a halt and kick me off.

Remarkably, I was able to get my video connection back up and running, while spawning a few other browser windows to see what CBS, NBC, and NPR had to say about the event. CBS, in its lameness, tried to force me to enter my zip code before gaining access to the news, and while NBC played no such shenanigans, the server was too bogged down and I got an error. NPR let me in but didn't have the quality or pace of updates that CNN had.

Every three minutes I hit the refresh button on my browser and CNN had new images, new copy, and unbelievably, new quotes and interpretations of the event. It was at this point that the epiphany struck.

In my 10 years online, December 16, 1998, was the first day the Internet was truly a necessity for me. Sure, the Internet is useful—I shop, buy concert tickets, book travel arrangements, keep in touch with friends, and use maps, dictionaries, and encyclopedias regularly online. And I bookmark sites such as Big Yellow, Merriam-Webster, Ticketweb, and Internet Travel Network for convenience, but not necessity.

My political position aside, I consider news of such global impact a necessity, not a convenience, and I was ecstatic that I could see, hear, and read simultaneously the news, in realtime, as it occurred. I was grateful that the Internet actually came through for me, and ironically, the Internet was actually built for such events: communication during war time.

Designed by the Advanced Research Projects Agency, ARPANET, as the Internet was originally called, sent its first networked transmission in 1970 between computers at the University of California Los Angeles, UC Santa Barbara, Stanford, and the University of Utah. It was a few years later that the network was taken over by the U.S. Department of Defense as an alternate communication method and then developed as its official computer network. It's a rarity that such future "visions" (especially as they relate to technology) ever pan out. I'm glad this was an exception.

The second part of the epiphany relates to the gathering of knowledge. As I repeatedly hit the refresh button on CNN and watched the story change before my eyes, I realized this type of "content change" is much easier to identify online than it is with television or radio. I also realized that I was seeing the event as reporters were seeing the event, gathering my own Associated Press reports and global viewpoints. I was witness to the changes in perspective and the collection of facts from various sources, and was responsible for filtering my own information from the sources available.

I could easily trace each network's political bias by which facts were erased, which quotes removed, and which pictures published. There wasn't enough time for editors to mask opinions. I was also able to pull up the *London Times* for a non-U.S., but English-language, perspective, and check out newsgroups and chat rooms packed with people who could provide some historical context for me. For this, I realize the Internet is truly my friend.

I've never been able to get such a clear picture of an event, and certainly not one as critical as this.

The whole experience actually gave me chills, causing me to step back and think: What about all those people who don't have computers and Internet access? I got sad at the thought that millions of Americans, and billions of others, may never have access to this quality of information because they don't have enough money, don't go to the right schools, and don't live in the right cities. (And we aren't about to change the broadcast media field into a credible discipline thanks to corporate sponsorship…) Instead, those people will have to rely on Connie Chung's dodgy smile and the two-month delayed Barbara Walters special interview with Madeleine Albright's niece.

And that's unfortunate.

**Every three minutes I hit the refresh button on my browser and CNN had new images, new copy, and unbelievably, new quotes and interpretations of the event.**



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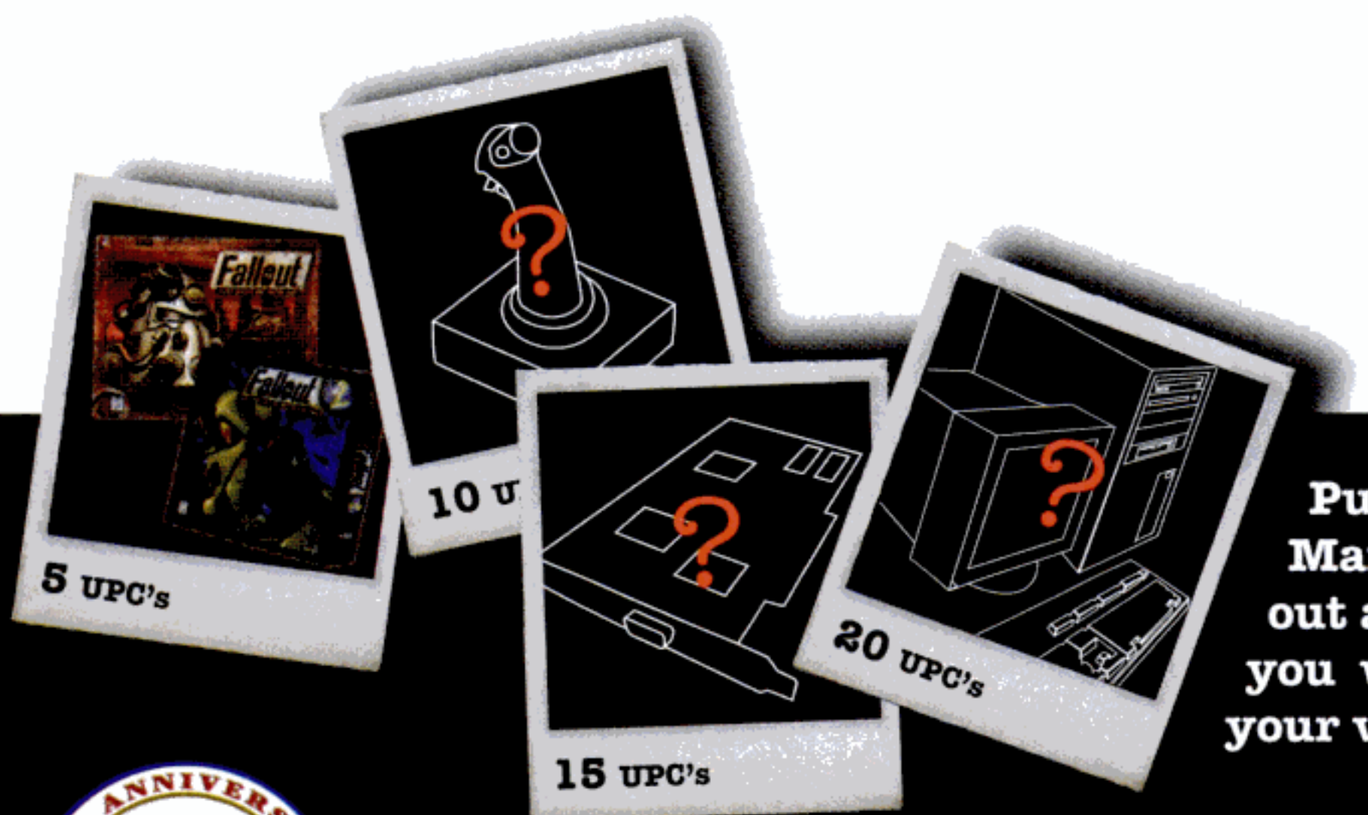


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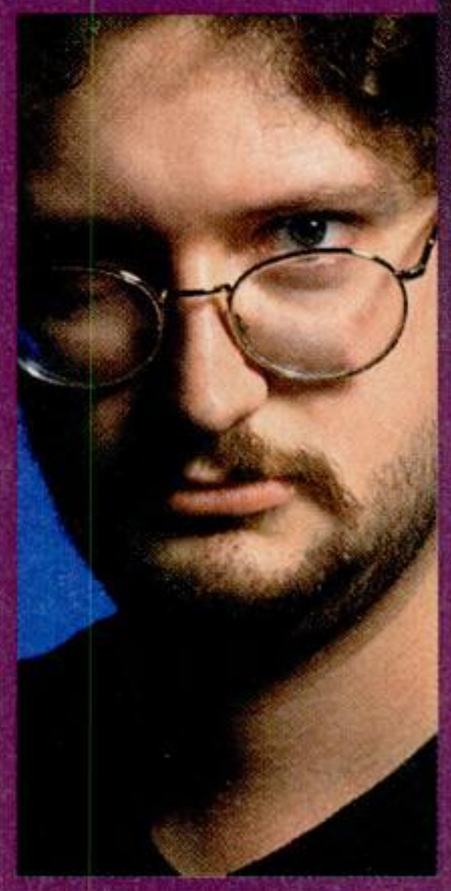
# GAME THEORY





**T. LIAM MCDONALD**
is a veteran of PC Gamer magazine and is much bigger than he looks in this picture, so keep that in mind before writing him any hate mail at **tmcdonald@maximumpc.com**.

## How Real is Too Real?

### WHEN GOOD SIMS GO BAD

When is a game not a game? When it's a simulation.

Realism—accurately reproducing cause and effect in an environment based on real-world physics—has become the Holy Grail for some games. The theory is that a certain type of gamer wants to experience the exact same limitations and effects he would experience in the real world. In flight sims, this has long meant that planes stall, spin, and behave within the proven parameters of their real-world counterparts. Flying within these limitations is part of the thrill for hardcore flight-sim fans, but the best sims always offer the chance to turn realism off and just shoot.

Andy Hollis, producer for Origin and the man behind such hyper-realistic sims as *Longbow* and *F-15*, once told me, "I don't believe in creating realism merely for the sake of realism. I only think it's necessary if it directly effects gameplay and the specific decisions of the gamer."

As we've seen with two recent titles, however, realism can go horribly awry.

Both *Trespasser* and *Grand Prix Legends* have their defenders; well they should, since both contain some truly stunning feats of programming and design genius. But each has core problems that prove the designers were so fixated on realism for the sake of realism that they forgot to make an actual game for an actual human being to play.

**The designers were so fixated on realism for the sake of realism that they forgot to make an actual game for an actual human being to play.**

*Grand Prix Legends* is the lesser sinner because its failings are mostly of omission. Developed by Papyrus, the long-standing developer of ultra-realistic racing sims, *Grand Prix Legends* is everything a true hardcore racing fan should expect. The physics are modeled in exacting and impressive detail. No one, not even an experienced racing simmer or (especially) an actual race car driver, could drive this game right away. It takes hours and hours of practice to learn these complex models. Racing fans lap this up, and nonfans admire the attention to detail.

But Papyrus didn't bother to put in any effective difficulty or realism toggles to make this game approachable by the casual racing fan. Real-world physics in a game are admirable. Mandatory real-world physics in a game are stupid.

And *Grand Prix Legends* is "overmodeled." This comment prompts contemptuous responses from fans demanding to know how physics can be "overmodeled." Here's how: It's a game! It's a two-dimensional re-creation of an activity that occurs in three dimensions. In this game, you call upon precisely *one* of your senses (sight) with a tiny bit of help from another (hearing).

In real driving, feel is essential. The feel of the wheel in your hands and pedals under your feet. The feel of the road under your tires. The feel of the car at that precise moment when the wheels lose traction and begin to skid. Driving, more than flying, is a matter of feel, and that sensation is utterly closed off to you on the PC. Ergo, you don't have the sensory information needed to cope with this physics model. Ergo, the game becomes even more of a challenge than driving real cars. Match that with Papyrus's laughable refusal to even attempt force-feedback support (they say no force-feedback device can accurately re-create the feel of driving these cars) and you have a sim that's a realistic *model* of an activity, but not a realistic *re-creation* of an activity.

Then we have *Trespasser*, which makes much hay of its physics model. This is proper, since the bipedal and object physics are superb. You slow when walking up hills, objects arc through space, and things react to each other in the environment. You can hit things with other things, throw stuff, and generally act like a monkey in a cage full of toys. The one thing you can't do is have any fun. *Trespasser* is a gas for about 15 minutes, as you learn to manipulate the screwy arm interface that bends at the wrist and elbow, then spend time hitting things with a baseball bat, tossing boxes, and looking at your copious cleavage. So after the developers created a world full of objects that react realistically, what do they give you to do? Run around, collect key cards, and sometimes shoot a dinosaur. Whoopie.

Is creating a realistic game world enough? Do developers get so impressed with their code that they forget the end result should be a product that John Q. Sixpack will pick up and actually enjoy for 40 or more hours? Creating elaborate physics models merely for their own sake is a waste of both the developer's and the gamer's time, effort, and money. If physics are not in the service of engaging gameplay, as they are in Jane's flight sims and Looking Glass's stunning *Thief*, then they have no place in a game. Arcing objects and realistic skids don't impress me. I'll trade them for a few hours of engaging gameplay anytime.



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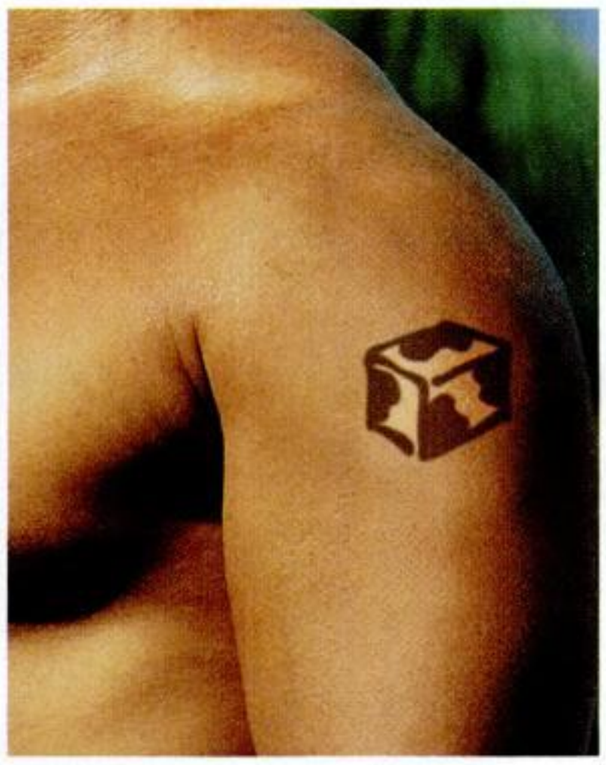

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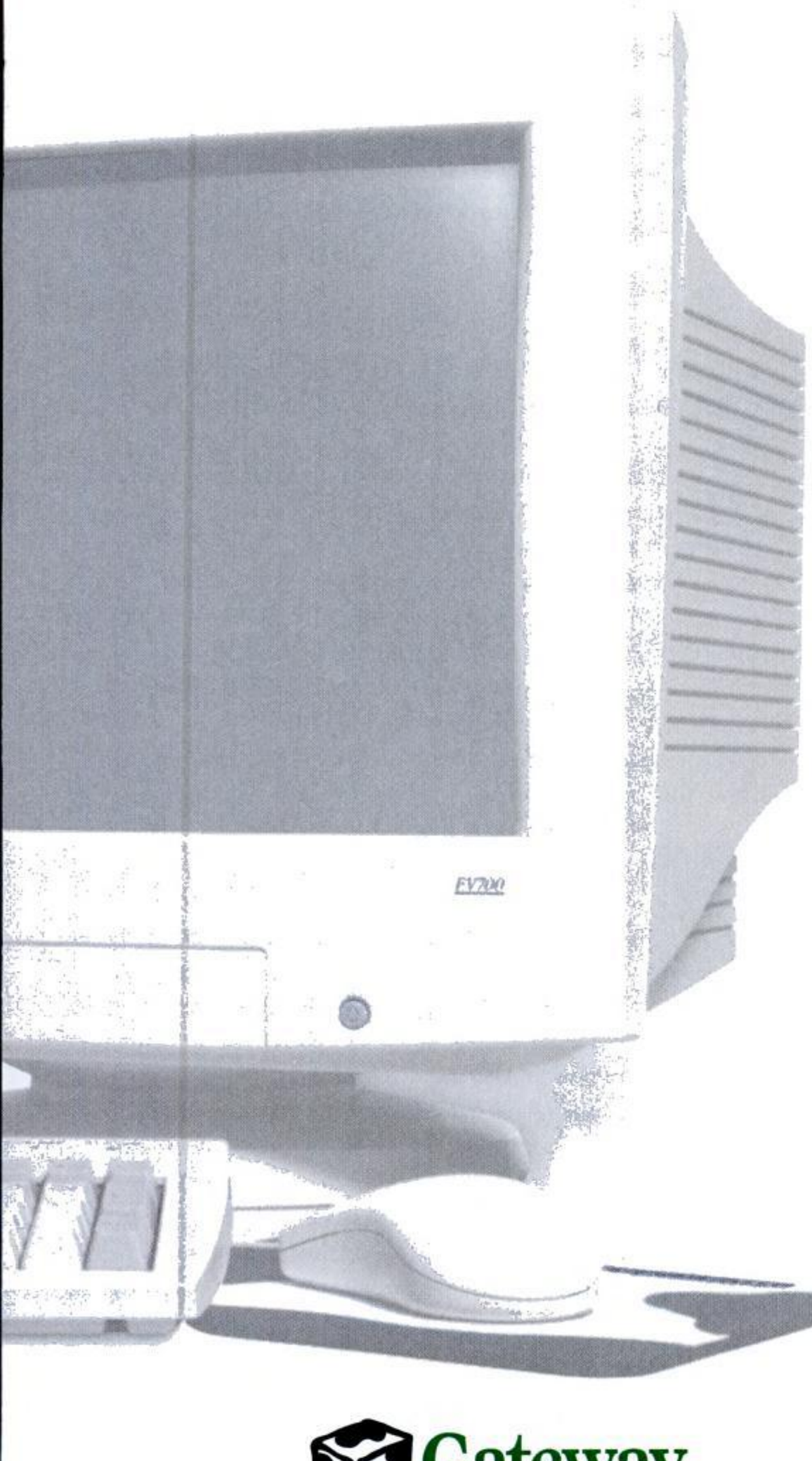


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# LAST MAN stand

## Iomega's Ted Briscoe explains why Zip won't live forever and tells what the company has done to rectify the much-discussed "Click of Death" syndrome.

**Maximum PC Iomega just purchased SyQuest's assets for $9.5 million and has settled the patent infringement suits between the two companies. How surprised were you when SyQuest first filed for bankruptcy?**

**Briscoe** To say it was a surprise would not be honest. We've struggled for the last couple of years trying to understand SyQuest's business model, and frankly, we haven't been able to make any sense out of it. SyQuest did some things that helped the category grow and gain greater awareness through marketing. And in that respect, we're sorry to see any player move out. But any time a competitor leaves, it creates opportunities—and we certainly intend to capitalize on the opportunities that will be created.

**Maximum PC OK, so how big was the party?**

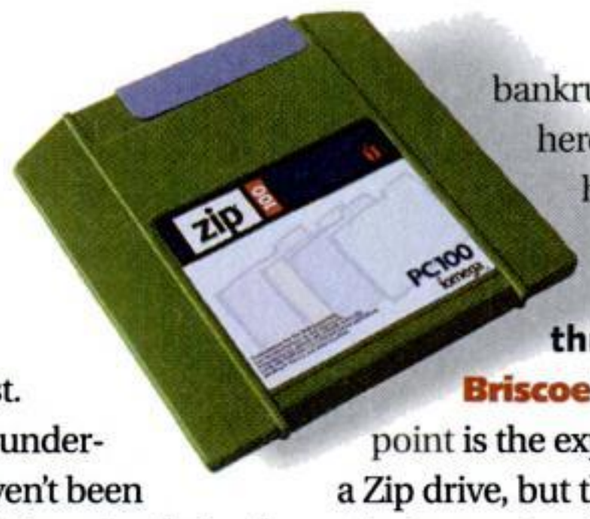
**Briscoe** [laughs] We did not have a party.

**Maximum PC OK... So, Avatar, Nomai, and now SyQuest. Is there a curse on the removable storage market?**

**Briscoe** I don't know if it's a curse. Iomega created a new consumer category. Many companies have tried to imitate what we've done and have not been successful. A lot of that has to do with our position as a market leader. We've shipped 20 million Zip drives and more than 120 million Zip disks. Certainly that leadership position creates barriers that make it more challenging for competitors to enter the space. When you look at service bureaus or sharing information with a colleague, you can feel comfortable that they'll have a Zip drive to access that information. Other people trying to enter the space have not enjoyed that opportunity.

**Maximum PC So is it possible for anybody else to get into this market?**

**Briscoe** Absolutely. Three or four years ago, Iomega was a struggling company close to bankruptcy. We weren't expected to survive. We're not sitting here in a leadership position fat, dumb, and happy. We have a strategy, we're focused on executing it, and we're moving forward with confident paranoia.




**Maximum PC What's your biggest threat right now?**

**Briscoe** The single biggest threat from a technology standpoint is the explosion of low-cost PCs. We'd like all OEMs to include a Zip drive, but they're already struggling with having to include obsolete technologies such as floppy drives. It may be that we have to offer à la carte solutions with this segment. But to think we're going to be able to reduce our costs on our drives fast enough to be a large player in that market is probably a bit unrealistic. We built this company on setting and achieving unrealistic goals, and we have to focus on reducing cost and improving the quality of our OEM products as rapidly as possible.

**Maximum PC You referred to the floppy drive as "obsolete technology." Why isn't it dead yet?**

**Briscoe** It is dead. At least in terms of something people use on a day-to-day basis. Floppy drives are there because that's the way software was distributed several years ago. More than 95% of all software companies deliver their software on a CD-ROM or already installed on the hard drive. Virtually no archiving or saving of files is done on the floppy. But there is a huge installed base and there's a level of comfort that PC manufacturers have by staying with the status quo.

I'm not sure anything will replace the floppy drive as a standard in PCs today. Over time the floppy drive will be removed and most likely a Zip drive will be included. I just don't think there will be a one-for-one replacement of the floppy.

**Maximum PC Do you wish you'd made the Zip drive backward compatible?**

**Briscoe** No. We made a very deliberate

### PROFILE

**And he would be?**

*Ted Briscoe joined Iomega in 1995 and is the man in charge of the company's Personal Storage Division.*

**And I would know him from?**

*Ted's Zip drives and disks are about as popular as a cup of Starbucks coffee. Except with those unfortunate people suffering from the "Click of Death," that is. Regardless, the company has high confidence in its two newest products, the Zip 250, and Clik, a device primarily aimed at digital camera aficionados.*

**And I would care because?**

*All of Iomega's competitors fell like flies last year. Which leaves Iomega in an interesting position. Question is, can the company capitalize on the opportunity or will it suffer the same fate, especially in the light of emerging rewritable optical technologies?*

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**"Three or four years ago, we weren't expected to survive. We're not sitting here in a leadership position fat, dumb, and happy."**

decision not to go with backward-compatible products for three reasons. One is cost. When you have a drive that's backward compatible, you need multiple headsets. Right out the gate you've got a cost issue that's going to burden your design, even when you get to the point where people don't need, want, or even use the backward compatibility. The second was a growth path—the capacity was clearly limited. The third area is performance. We didn't want to encumber the design or the performance of the drive. Adding backward compatibility wouldn't have extended the drive's life, and we didn't want to burden our design or cost strategies.

**Maximum PC But Sony's doing it with HiFD. Is that a good strategy?**

**Briscoe** We don't think that's the right approach. Right now, Sony has an external HiFD drive with floppy compatibility. Every PC I know of has a floppy drive already in it. Why would you buy an external device with floppy compatibility instead of using the one built into your PC?

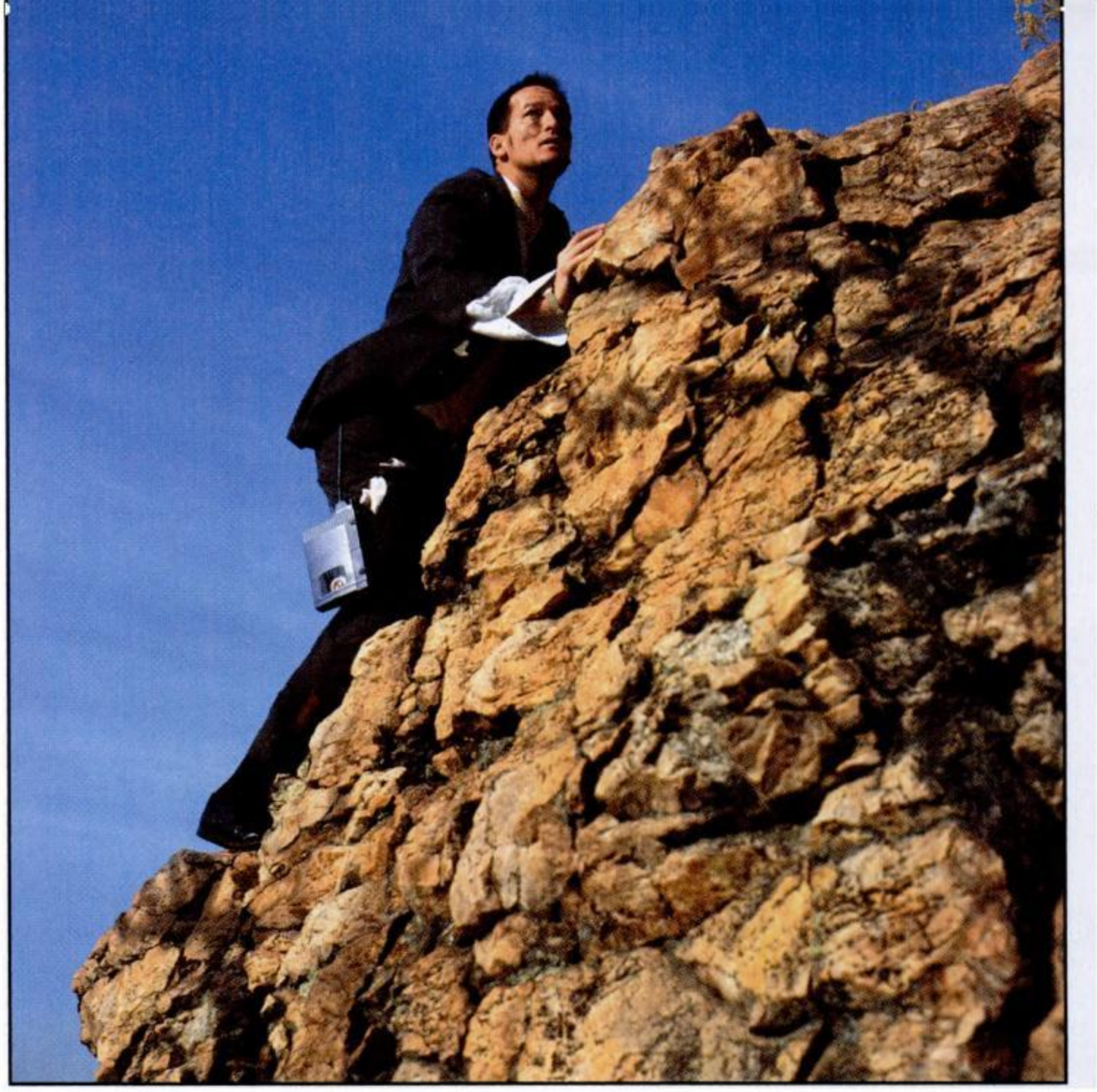
**Maximum PC What other forces threaten your business?**

**Briscoe** Down the road, CD-RW and DVD technologies will increase in performance and come down in price. We need to ensure that Zip is not a victim of technology evolution. At the same time, we have to know when to leapfrog to the next technology. Zip has been around for four years now, and we expect it will have a long, healthy life several years down the road. But it won't last forever. We need to keep our eyes open and be willing to cannibalize some of our own business at the appropriate time.

**Maximum PC Do network computers pose any threat?**

**Briscoe** You could look at them as a threat; you could also look at them as an opportunity. People want control over the files that are most important to them. That's human nature; it's an emotional requirement, even though down the road you may utilize storage service providers so you don't even need local storage. We think people will want it; they'll want to take their files, stick 'em in the drawer, and be able to protect them.

We're in the business of protecting people's memories and providing a level of certainty around your data, be it pictures of your kids or financial information. I don't look at servers, be it in a home or corporation or provided through a local telco, as something that necessarily spells demise for our products. If anything, it increases the opportunity because there's going to be an explosion of information out there that people are going to want to keep, protect, and cherish.



**"Zip has had a very solid life, but it won't last forever—it would be naive and really foolish on our part to think so."**

**Maximum PC One can't mention Iomega without someone bringing up the "Click of Death" syndrome.**

**Briscoe** [sighs] Yeah, the clicking symptom that occurs with some drive failures has gotten a lot of attention recently.

**Maximum PC Do you think the attention is warranted?**

**Briscoe** That's debatable. If you look at this in terms of how large of an impact it is, our analysis shows that the clicking symptoms manifest themselves on less than 1% of our drives. It's not a huge problem, but the fact that anybody is having a problem makes it important enough for us to solve.

**Maximum PC So what's the actual problem?**

**Briscoe** It's head damage. Our heads—for a variety of reasons—become detached from the actuator assembly on the drive. As they try to read the media, you get a clicking sound that ultimately could mean that your drive is damaged and needs to be swapped out. Some clicking is just associated with the normal performance of the drive, which has caused some confusion out there. People hear a clicking noise, but a lot of times it's just the heads going back up the load ramp and locking on. What you don't want is it to be down off the load ramps when you stick your media in—that could damage the heads. The problem was that there was sometimes too much force coming up the load ramp. You'd come up that load ramp and hit what's called the crash stop on the drive, sometimes jarring the heads loose. We've implemented this "soft park" so it brings it up slower and you don't get that jarring effect.

**Maximum PC Do consumers get new drives if they run into the problem?**

**Briscoe** Absolutely. We'll take whatever steps are necessary to get the drive swapped-out immediately. That's not to say that there hadn't been some issues with that. We have a large customer-support organization, but that's the intent of the company and we stand behind it.

**Maximum PC But you just had a rebate snafu where you had to pay out more than $900,000 to the FTC. What happened?**



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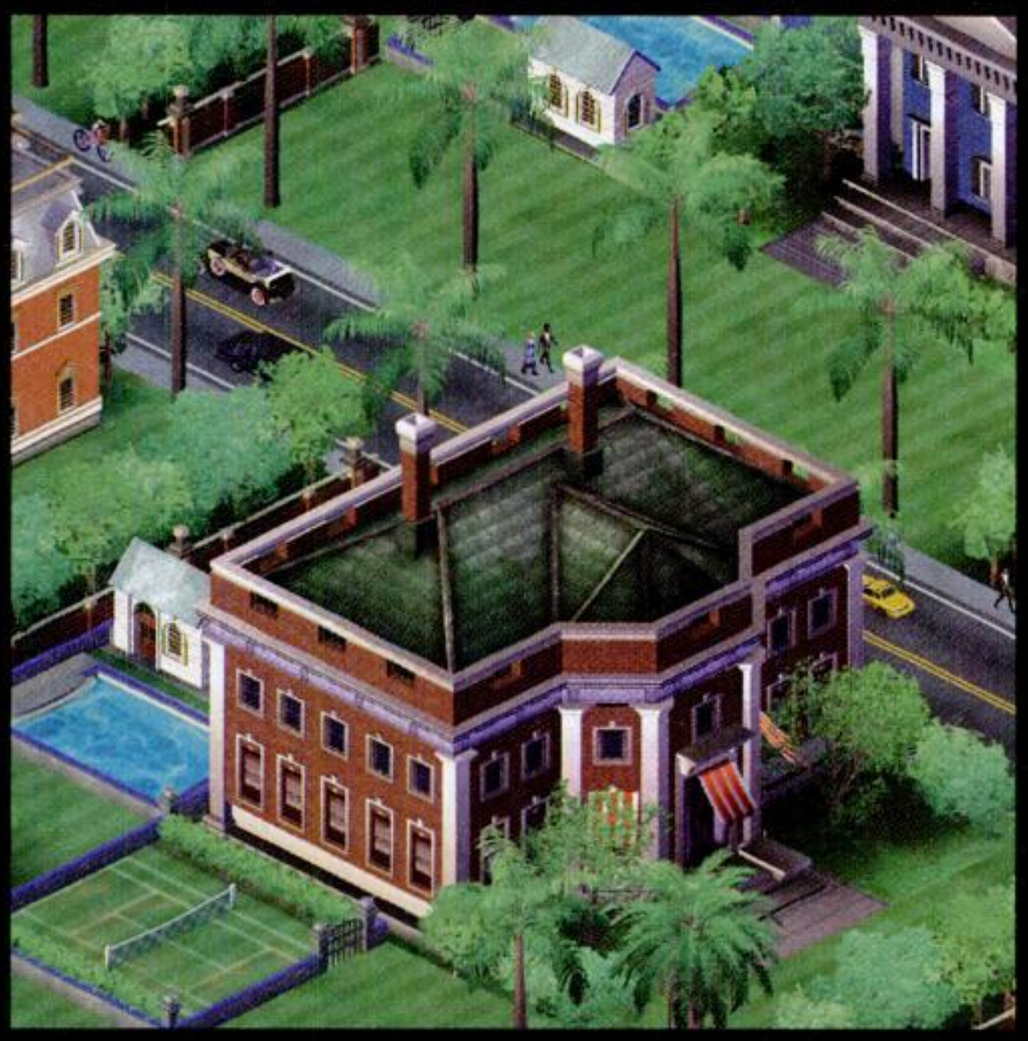

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**Briscoe** We really screwed up. We had seen rebates successfully executed in the industry and thought it would be a fun way to get lower prices out to consumers. But our execution was terrible. We picked a partner that was not capable of handling the volume. And we didn't monitor the performance. In the process, we lost a lot of rebates and the turnaround time wasn't acceptable. So we made mistakes; but we tried to rectify them as quickly as we found them. Unfortunately, it took a long time and we had a lot of very unhappy customers who felt like they were misled.

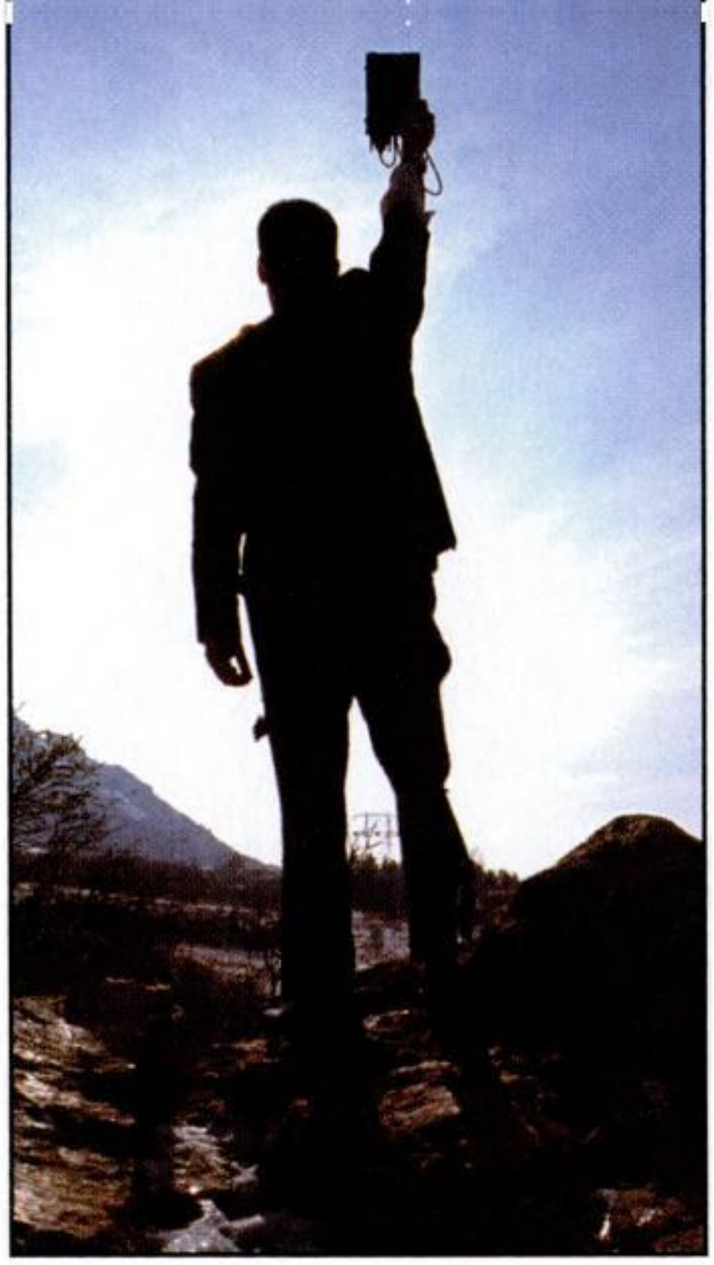
Since then, we've done three rebates with a new company where we've had zero problems. The turnaround time has been less than two weeks, with virtually nonexistent problems.

**Maximum PC Why did it take so long for your new Clik media to come out?**

**Briscoe** Fair question. At the fall Comdex in 1996, we launched a technology initiative called "In Hand"—a miniaturized, PC card–based, 20MB Zip drive. The strategy was to throw the idea out, share the vision, see what kind of reaction we'd get from the market, and then move on. The response was phenomenal! But as we visited customers, the universal response was, "We love the idea. But the capacity isn't enough, and it weighs too much, and the shock and vibration specs aren't going to cut it. Oh, and by the way, you're using too much power." In other words, they told us our baby was ugly. So we executed an entire redesign of the product. The initial concept was going to be a Zip-compatible product; it was going to have a linear actuator like the Zip drives. But by moving to a rotary actuator, we could address the space and power issues raised. The actuator on the Clik drive today is very similar to what you'd see on a hard drive. This was a very painful decision for us, but it was the right thing to do. At the same time, we looked for ways to increase capacity. By relaying some of the electronics, we were able to increase the space for a disk without increasing the dimensions of the drive. That got us up to 40MB. We were also able to reengineer some of the electronics to get our power requirements down to an acceptable level. We also did a lot of work in the mechanical design to improve the shock and vibration specs.

**Maximum PC And why were you so late with your USB Zip drive?**

**Briscoe** We missed some signals early on with USB and it wasn't until we dialogued with Apple early last summer that we

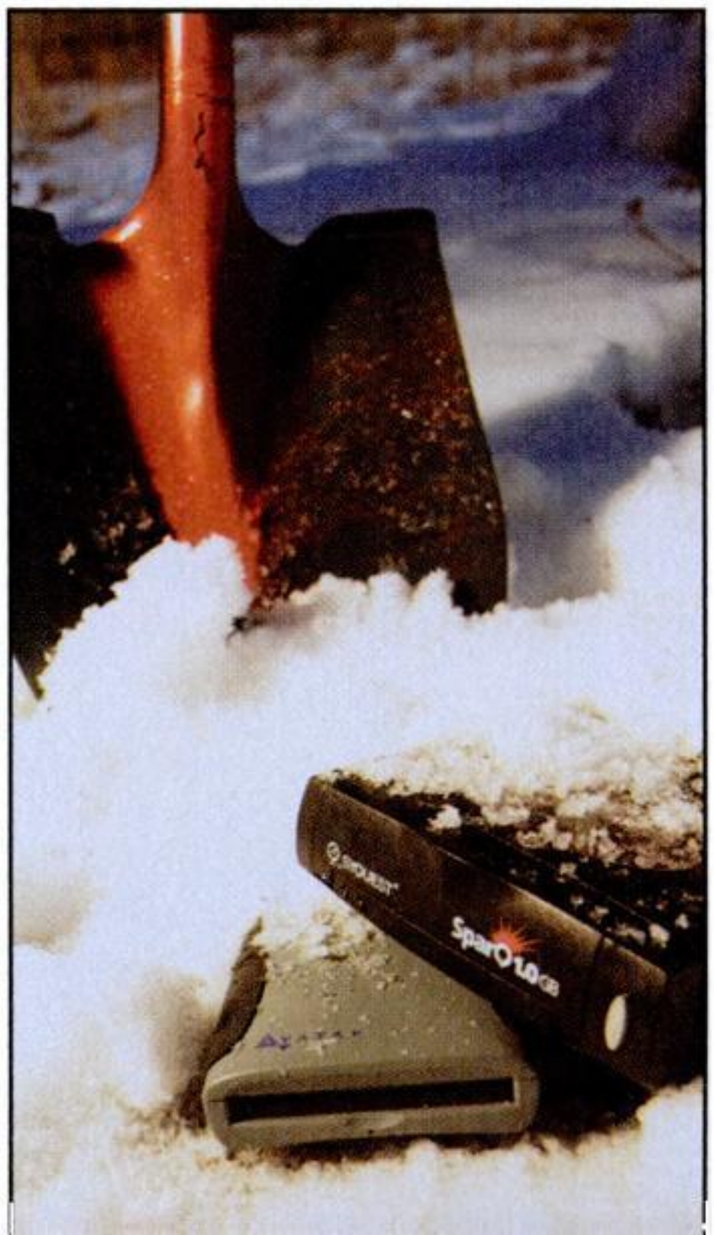


realized we were behind the curve. The delay there was just in a blind spot in our market intelligence that we quickly made up for.

We were well into the Zip 250's development when we realized we had missed the USB opportunity, but we'll have a USB-based Zip 250 drive later this year.

**Maximum PC Is it possible that the entire world will one day be saturated with Zip drives?**

**Briscoe** I don't think so. Zip does have a finite life. I don't believe any technology will last as long as the floppy drive did. The rate of change, the acceleration of new ideas, new ways of pulling solutions is moving too rapidly. Zip has had a very solid life, it's been one of the most successful consumer-electronic products ever introduced, but it won't last forever—it would be naive and really foolish on our part to think so.



**Maximum PC Lastly, let's talk about your Record/Play initiative. Why did Iomega take a stand against MP3s?**

**Briscoe** We're not necessarily taking a stance in that debate. We're trying to solve problems that the industry is struggling with right now. Our partners are content publishers, and the support we've received from the Recording Industry Association of America and a lot of the big record labels has been quite positive. One of the things they're really struggling with is the inevitable nature of the Internet as a distribution vehicle. At the same time, they're very concerned with losing total control over their assets.

But we're not making a statement on whether content should be free or not. All we're doing is giving them a way to safely—and securely—control the distribution.

**Maximum PC Who takes responsibility if the media gets corrupted?**

**Briscoe** The content provider. Iomega is not getting into the distribution business. We're just providing the extensions to the toolkit so that the individual policies of the people distributing the content would take precedence. If you were buying music from Warner Entertainment, that would be an issue between Warner and the user. I can't comment on what their policies may be.

**Maximum PC Our informal research indicates Zip drives are most often used to store two things: MP3 files and porn.**

**Briscoe** There is some truth to that, but we can't control what content our customers are getting into. Zip drives are the catcher's mitt for the Internet, and people are going to catch what they want to catch. I don't want to make any value judgment on what people do with their spare time.

We do ongoing testing of users all the time. After analyzing the monitoring software in one of our control groups, we discovered the most active user was a teenage boy. We called him up to ask him what he was doing with the drive. He was very reluctant, but we promised not to disclose anything. It turned out that he was downloading pornography and distributing it to his friends!

**Maximum PC So you're cool with that?**

**Briscoe** [laughs] Everybody has their own values!



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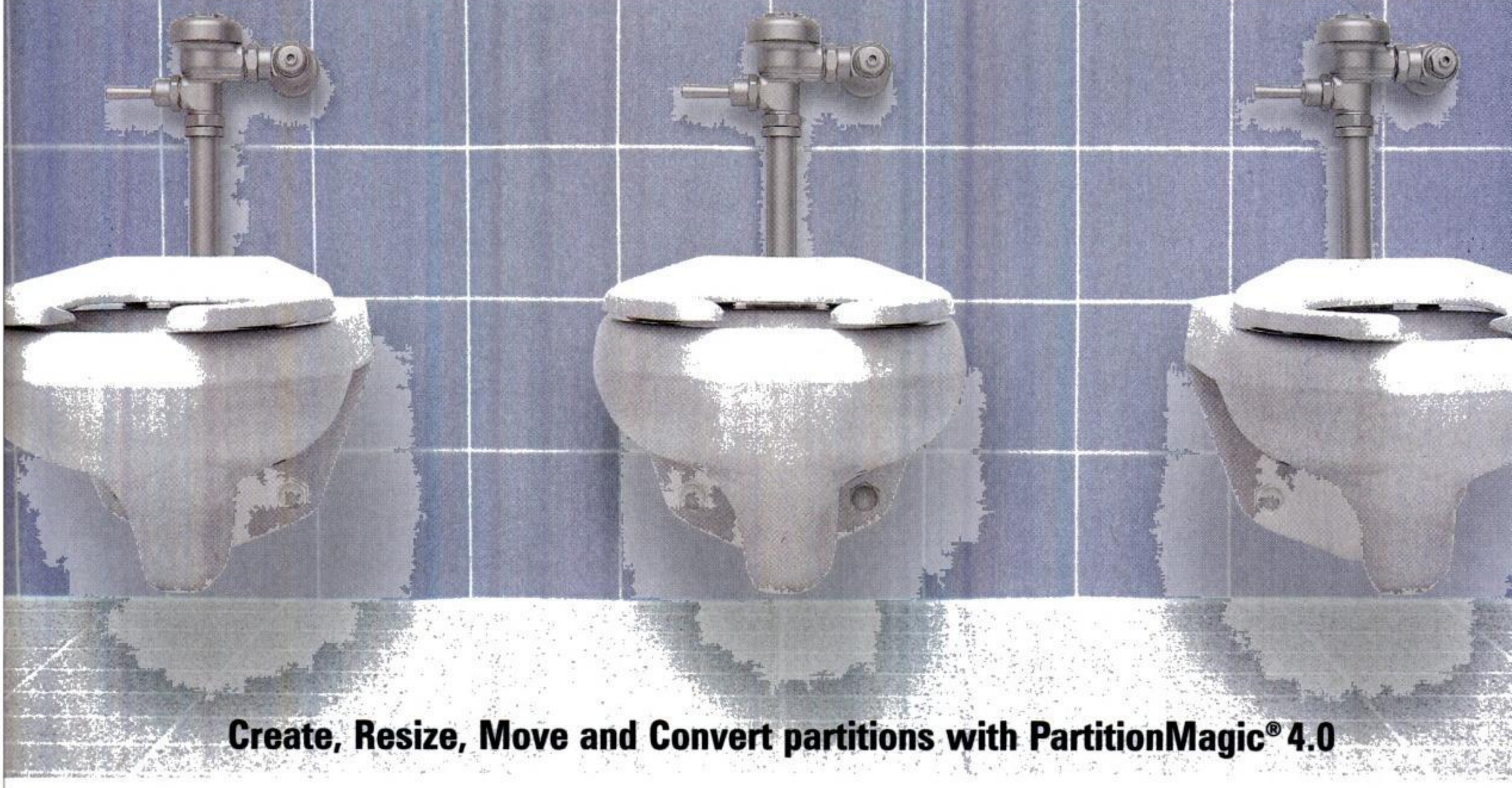
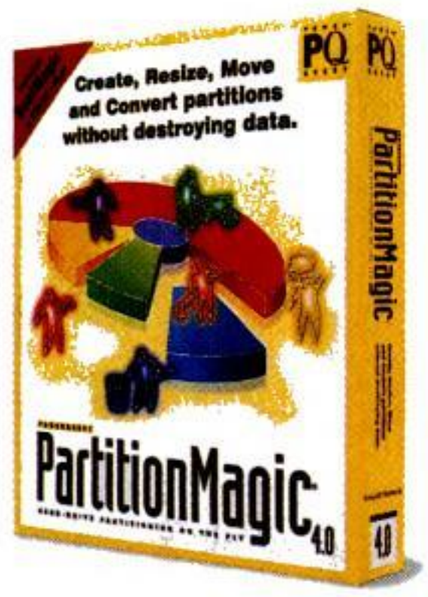


## Create, Resize, Move and Convert partitions with PartitionMagic® 4.0

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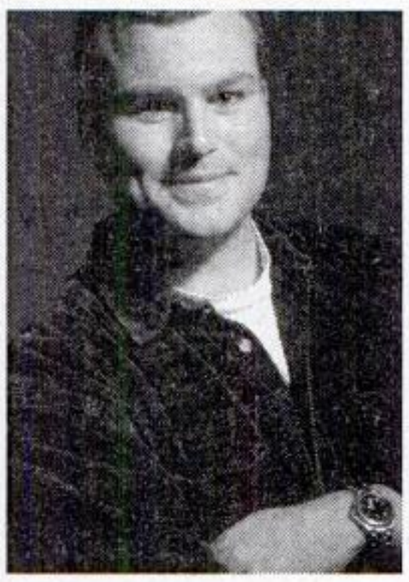
PURE PC POWER boot

boot REPORT

INSIDE TECH FOR ADVANCED PC OWNERS



*This month our Departments Editor,* ***Sean Downey,*** *kicks off a new feature in the bootReport: monthly editorials from the staff that provide a fresh, alternative voice*

# The Source Code for PC Power

Welcome to the bootReport. OK, so this is issue 07 and you've been here a while, but it's better late than never to fill you in on the purpose behind this monthly eight-page collection of everything you loved about *boot* Magazine. Put simply, the bootReport is designed to feed the needs of the individual obsessed with pushing his machine to the absolute limit.

In the bootReport, you'll find the lowdown on all the new concepts and components that make up the PC experience. In addition to how-tos on subjects as varied as MP3s and dual booting, the bootReport explores in-depth such topics as CPU architecture and the inner workings of your hard drive. Think of it as a newsletter for the PC obsessed.

Now, we're not talking dry egghead articles here. Our goal in the bootReport is to take controversial or difficult-to-understand topics, slice them into bite-sized bits, sizzle them to their piping-hot potential, and season them enough to make you gulp down antacid in the middle of the night. Your PC obsessions deserve more than a drab textbook explanation or a pundit's oversimplification. They deserve the violent bout of indigestion that comes from swallowing a topic whole.

Just check out the two-course overclocking feast served up in this month's White Paper and 12-Step. Far from being the dark art spoken of in hushed tones in *boot* 05, overclocking has become a legitimate way to squeeze more performance from your CPU in order to stave off obsolescence. We give you the latest on this controversial procedure so you can take advantage of it before the CPU manufacturers fall into step behind Intel's new overclocking protection scheme (see page 26).

The bootReport is all about making the most of what you've got. It isn't a clubhouse for the technological elite only concerned with building the biggest, baddest rig they can afford. Any slick computer store salesman can tell you to upgrade. We aim to deliver the goods on extending the life of your system long enough to intelligently upgrade when the right part comes along.

When it comes down to it, a PC can go only as far as you know how to take it. In order to take full advantage of all the horsepower offered by today's hardware, you need the bootReport. Besides being the home of such *boot* favorites as the 12-Step and White Paper, the bootReport is expanding into new areas. On this rotating editorial page, all the Maximum PC editors you know and love will spout off on the subjects they hold near and dear. And next month, we'll introduce a new bootLab Stories section, where we relate our experiences testing and troubleshooting equipment under review.

**"The bootReport is all about making the most of what you've got. It isn't a clubhouse for the technological elite."**

We aren't knowledge brokers out to tell you what you should be doing with your PC. We subscribe to the open source code movement. Just pick and choose from the articles contained within and compile the knowledge into the PC of your dreams. If you can use a bootReport article to take your PC to new heights, we're doing our jobs. But if something we've told you makes your PC suck wind, we need to hear about it.

If you want to weigh in on anything covered in the bootReport or suggest future topics, drop me a line at **bootreport@maximumpc.com**. I look forward to hearing what you have to say.

## In This Issue

**B1 ▶ bootED**
Sean Downey

**B2 ▶ Cogitating Wildly**
The Pentium III Controversy

**B4 ▶ White Paper**
The Fine Art of Overclocking

**B6 ▶ 12-Step**
How To Overclock



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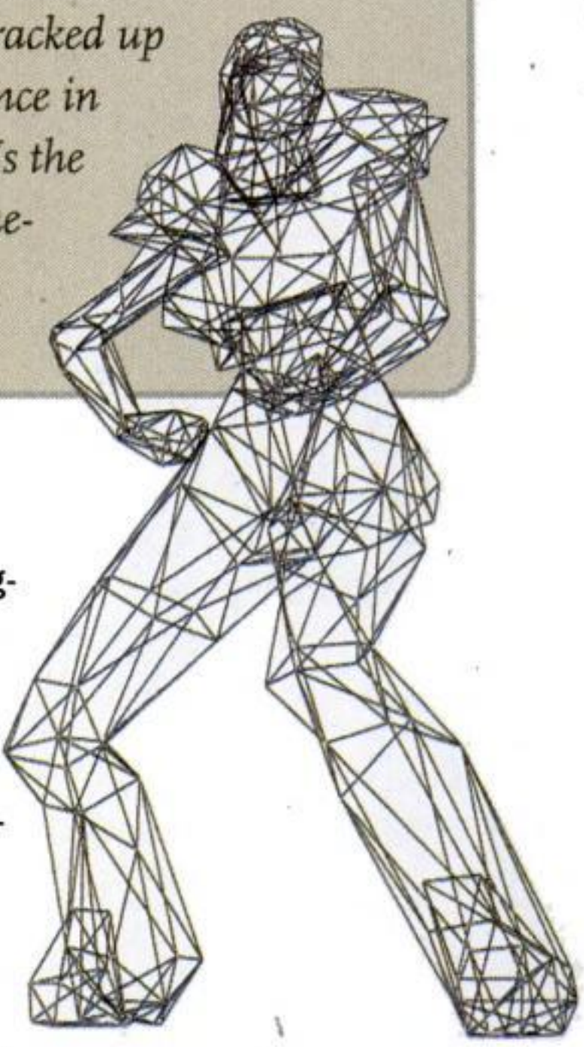
# The Pentium

*The introduction of any new technology always stirs up a debate. With Pentium III processors making the slow technological trickle down to consumers' hands and developers frantically rewriting their code to take advantage of the new Streaming SIMD Extensions (SSE), controversy over Pentium III's potential has already reared its ugly head. In this case, Tom Halfhill's article on SSE (at the time called KNI), 3DNow!, and MMX caused one of the smartest readers in the world to take him to task on many of the points made in his column. Are the new CPU instruction sets all they're cracked up to be? Will they make any difference in how 3D is handled by your PC? Is the polygon half rendered or the geometry half transformed? Let the 3D debate begin.*



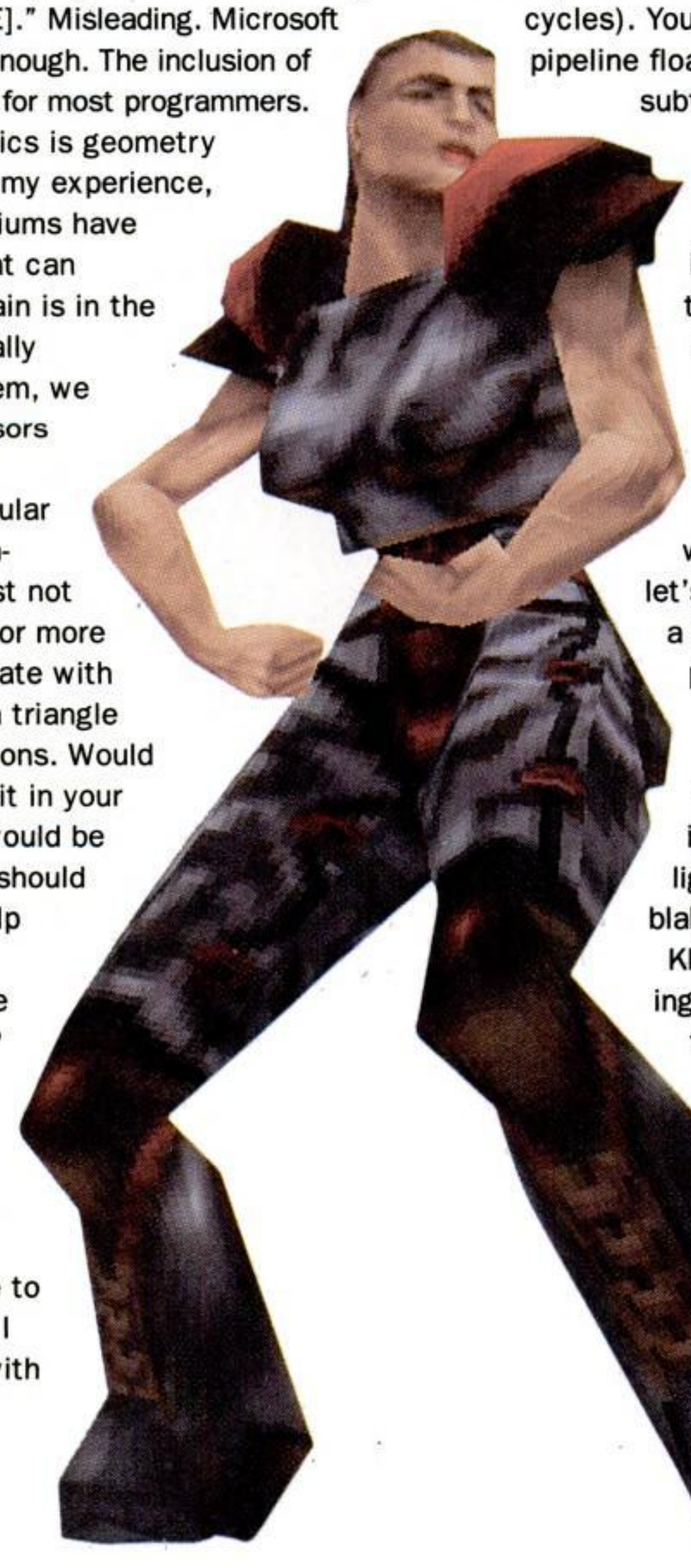
## THE POLYGON IS HALF RENDERED

I guess it is true that a little knowledge is dangerous. Let me please correct Tom Halfhill ("one of the most knowledgeable experts on processor technology") on several points in his December 1998 Fast Forward column.

"Your software won't run any faster till programmers start using the Katmai New Instructions (KNI) [SSE]." Misleading. Microsoft will have these things in DirectX soon enough. The inclusion of SSE and 3DNow! should be transparent for most programmers.

"The most critical part of 3D graphics is geometry transformation." This is very funny. In my experience, this is the least important. Most Pentiums have very fast floating-point units (FPU) that can pipeline instructions. The realtime strain is in the rendering. That's why 3D cards originally came out. If geometry were the problem, we would be buying extra math coprocessors (like in the old days).

"A 3D object that has 1,000 triangular polygons" has 3,000 vertices the computer has to deal with. Now, this is just not true. Typically, each vertex has three or more faces attached to it. Let me demonstrate with the simple example of a cube. Using a triangle renderer, this would take twelve polygons. Would you then do 36 calculations to rotate it in your routine? With only four vertices this would be silly. Your calculation for 1,000 faces should be about 300 vertices. MMX can't help because it uses integers. Older 3D engines use integer math. You can use fixed-point math with MMX can't you? The real problem stems from the fact that the MMX instructions and the FPU can't operate at the same time. You have to flush the registers and do other things. So it's slow to switch between the two. In addition you have to do a lot of casting, which takes time. I think that since the FPU got so fast with the Pentium, there just isn't a way to justify using fixed-point math and the MMX instructions. Face it—MMX is a flop.



Computers aren't good at floating-point math. Floating-point multiplies and divides are faster than integer multiplies and divides on the Pentium (in terms of clock cycles). You can also pseudo-pipeline float additions and subtractions.

84,000 operations is a lot. Even neglecting the fact that you are off by a factor of three, 84,000 calculations takes almost no time on a Pentium computer. On my Pentium 133 (no MMX), I tested a program that does the 84,000 operations you mention. The time is about 16 milliseconds. That is with no ASM code. On a Pentium II 400, I bet that would go down to about four milliseconds. Now let's look at what really takes the time. Let's take a 640x480 screen and manually set a 16-bit pixel to a color. Thirty-two milliseconds on my 133. No math. Now let's add on depth calculation, such as a floating-point divide for every scan line of a polygon, since the divide is much slower than the multiply. Add dynamic lighting calculations. Add alpha blending. Blah blah blah. That is the meat of the time.

KNI [SSE] and 3DNow! "can perform two floating-point operations at once." I'm sure you know that SSE can do four operations at once. Will this help geometry set up? Yes. By a factor of four? Maybe in some cases, where the data is packed correctly with SSE. Since 3DNow! uses the same registers, it should be less than a factor of four. Can SSE also help rendering? Yes, the Streaming SIMD Extensions have a reciprocal instruction, which will help with those slow divides that are necessary for depth calculations.

*—Brian Martin*



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# Controversy

## THE GEOMETRY IS HALF TRANSFORMED

Thanks for your detailed comments, Brian. However, I must take issue with some of your statements.

While it's true that the addition of SSE and 3DNow! instructions to APIs such as DirectX will bring some benefits to programs that don't specifically use the new instructions, by far the greatest acceleration is achieved by programs that do use the instructions. But we already know this from past experience with MMX.

Elsewhere in your letter, you say that MMX is a "flop." I don't entirely agree with that assessment, since one of the reasons MMX hasn't been more successful is that developers have rewritten relatively few programs to take advantage of MMX instructions. Relying on APIs isn't enough if you're aiming for maximum performance. This will be as true with SSE and 3DNow! as it is with MMX.

Geometry transformation is definitely not the "least important" part of 3D graphics. For one thing, nothing else can even start until the transformation is complete. The fastest rendering engine in the world will look very slow indeed if it can't get enough polygons to render. Of course, the reverse is also true—fast polygon setup won't help you if the rendering engine is slow. This is the weakest-link-in-the-chain principle. At present, I would argue that the FPU is the weakest link in the chain. Thanks to lively competition and rising demand, 3D graphics engines are getting faster all the time, while FPUs aren't improving at all except by means of higher clock frequencies, which is automatic. The latest Pentium II in 1999 will have the same FPU as the first Pentium Pro in 1995. SSE is an attempt to address that problem with real architectural improvements, not just clock-speed improvements.

My calculation of the number of vertices per polygons was based on a worst-case scenario; yours is based on a best-case scenario. I agree it would be unlikely for every vertex *not* to have another polygon attached to it—an extreme case might be an "explosion" in which a 3D object is blown to pieces and each fragment is an unattached polygon. Your example of a cube would have up to six polygons attached to each vertex (three faces per vertex, two triangles per face), but a cube is a classic regular solid, and not very typical of the irregular 3D objects in games. I don't know the "average" number of polygons attached to a vertex. It's probably closer to your extreme than to mine. Forgive my oversimplification in this case. If I had stated a more average number of vertices per polygons, somebody would have written me a letter asking why my numbers didn't add up, and then I'd have to write another long paragraph like this one.

Integer math is OK for many of the operations that come later in the 3D graphics pipeline, but it's not accurate enough for geometry transformation, which is what my column was about. If we didn't need FP then we wouldn't need SSE or 3DNow!. It's an unavoidable fact that single-precision FP is required for geometry transformation in games. (Double- or even extended-precision FP might be needed for more critical 3D CAD applications, but that wasn't the point of my column.) Therefore, I stand by my statement that MMX is of no help for this purpose—and not just because of the shared-register problem.

It's an acknowledged fact that computers aren't as good at FP math as they are at integer math. To begin with, it's much more difficult to represent FP numbers in binary, which is why even extended-precision (80-bit) FP math will produce rounding errors, while integer math using fewer than half that many bits is dead accurate. Although your statement "Floating-point multiplies and divides are faster than integer multiplies and divides" is true for Pentium processors, it's definitely not true for P6-series processors, such as the Pentium Pro, Pentium II, Celeron, Xeon, and Pentium III. Latencies (actual clock cycles required for execution) are four cycles for integer multiplies and 12 to 36 cycles for integer divides, compared to five cycles for FP multiplies and 18 to 38 cycles for FP divides.

Why are you arguing that polygon setup isn't important while all of the CPU architects are going to extreme lengths to make it faster? (Adding new instructions and registers to a 20-year-old CPU architecture is extreme, I think you'll agree. SSE even requires modifications to operating systems.) And don't forget that you can play a 3D game without those fancy after effects—indeed, many programs let you turn them off if you want faster action—but you can't do anything without the polygons.

You state: "I'm sure you know that SSE can do four operations at once. The next incarnation (due Q1 2000) will do at least four doubles at once." Let's be clear about this. SSE (the new instructions) can do four multiply operations at once, but the Pentium III (the new processor coming in Q1 1999) can do only two multiply operations at once. I've written a more detailed feature article with two figures that explains how this works in the February 1999 *Maximum PC*. If "the next incarnation" has a better FPU, it will be able to take advantage of the full width of the SSE registers to perform four multiply operations at once. My column for the December 1998 issue could not explain this situation in depth, so my remarks referred to Pentium III, not some future incarnation that we don't know about yet. I think it's safe to say that my December 1998 column might be confusing only to someone who already knows how SSE works but who doesn't know how a Pentium III works. Again, some simplification is necessary when writing a short column for a lay audience.

By the way, since you're focusing on every simplification I made, I'm surprised you missed a rather obvious one: geometry transformation for 3D graphics doesn't always require multiplying a 1x4 matrix times a 4x4 matrix. You can take shortcuts with a sparse matrix that has some zeroes, reducing the rotation and translation calculations to 1x3 and 3x3 matrices. —*Tom R. Halfhill*



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# The Fine Art of Overclocking

*Overclocking is all about creative expression. It's about the meticulous placement of a jumper or the gentle adjustment of a BIOS setting that takes your PC to realms only previously dreamed of. With every new processor from Intel, AMD, Cyrix, or IDT, imaginative types set to work on molding them into their ideal PC. But don't think it all comes down to what sort of magic you can conjure between your CPU and motherboard. Case interiors may contain all the objects, but it's the air flow that truly defines the limits of your artistic endeavors. Heat is the all-important factor that determines if your overclocked PC deserves the long life of a work of art or the short fizzle of a costly failure.*

*For those of you who see a faster PC within the marble confines of your case and are just itching to start sculpting, here's a rundown of overclocking, its perils, and its pleasures.*

*—Andrew Sanchez*

## The CPU or the system bus?

You can push your CPU into new realms by two methods. The simplest is to set the clock speed one speed higher than the current setting. Core CPU speeds are almost always a multiple of either 33MHz or 50MHz. Bumping a CPU up a bin (increasing it by 33 or 50MHz), is the most common overclocking technique. An example of this is taking a 233MHz CPU to 266MHz.

A CPU's clock speed is determined by two motherboard settings—the system-bus speed and the multiplier setting. In a 233MHz CPU, the system-bus speed defaults to 66MHz and the multiplier is set to 3.5x (66.6 x 3.5 = 233.1MHz). Adjusting the multiplier to 4.0 results in a 266MHz CPU (66.6 x 4 = 266.4MHz) clock speed.

Boosting the system bus beyond it's original spec is the second overclocking method. If our example of bumping up a 233MHz CPU one bin to 266MHz isn't allowed because the multiplier is locked, as is true with some recent CPUs, it's time to up the system-bus speed to achieve faster performance. For example, say our little 233MHz CPU has a motherboard that supports faster system-bus speeds, such as 75MHz, 83MHz, or even 100MHz. We can set the system-bus speed faster (66MHz to 75MHz), keep the same multiplier (3.5), and let them work their overclocking magic (75MHz x 3.5 = 262.5MHz). The BIOS should report that new CPU speed upon boot-up.

This is the preferred overclocking method on systems with locked multipliers, but it is fraught with danger. When bypassing a CPU's anti-overclocking protection by boosting the system bus, you run the risk of placing undue strain on your expansion bus.

## The dangers of a speeding bus

Whether you're running Super 7 or Slot 1, overclocking your system bus has a significant effect on your expansion slots. PCI slots are dependent on your system-bus speed, so adjusting your system bus will also adjust your PCI slot speed.

The chart to the right shows what PCI bus speed to expect as a result of tweaking your bus speeds.

| SYSTEM-BUS SPEED | PCI-BUS SPEED |
|---|---|
| 133MHz | 44.33MHz |
| 124Mhz | 41.33MHz |
| 112MHz | 37.33MHz |
| 103MHz | 34.33MHz |
| 100MHz | 33MHz |
| 95MHz | 47.5MHz |
| 83.3MHz | 41.65MHz |
| 75MHz | 37.5MHz |
| 66MHz | 33MHz |
| 60MHz | 30MHz |

At system-bus frequencies above 100MHz, the PCI-bus speed is determined by dividing the system bus by three. So a 100MHz system bus runs the PCI bus at 33MHz—perfectly spec'd for PCI 2.1.

Of course there are exceptions to the chart, since some motherboards that allow overclocking can lock down the PCI slot to a nominal speed. For instance Abit's BH6 440BX motherboard can run a 133MHz system bus with a 33MHz PCI bus. Check your motherboard vendor for exact information.

PCI devices are very sensitive to system-bus speed changes, and videocards are especially prone to acting the fool at settings higher than 33MHz. A misbehaving videocard is prone to visual glitches and crashes when you try to play a 3D-accelerated game. If you encounter this, it's time to rethink your overclocking strategy.

The AGP port speed is set as a ratio of the motherboard's system-bus speed. It will run either at a 1:1 ratio (100MHz system bus/100MHz AGP bus), or at a fraction (usually two-thirds) of it. So depending on your motherboard, your AGP bus could be running at 66MHz or 100MHz. Again, check your motherboard manual for exact info.

How fast is the ISA bus? Running at either one-third or one-fourth the speed of the PCI bus, ISA is slow enough to gain nothing from all the extra speed trickling down from your overclocked system bus.

## Why do some CPUs overclock easier than others?

Many factors affect a CPU's overclocking ability. In the case of the Pentium II, L2 cache speeds can make or break an overclocking attempt. Because the L2 cache runs at half the core CPU speed, overclocking can introduce unwanted latencies, which can cause the processor to crash. Some specific revs of the 300MHz Pentium II, specifically the SL2W8, are very overclockable, thanks to a faster L2 cache.

In the case of the Celeron, latency isn't a problem. Older Celerons don't have an L2 cache, and the Celeron A runs its L2 cache at full speed. Because there aren't any L2 cache latency issues bogging down Celerons, they've become highly popular as easily overclockable Pentium II killers on the cheap.

Motherboards weigh heavily in your system's overclockability. If your motherboard doesn't support nonstandard system-bus speeds,



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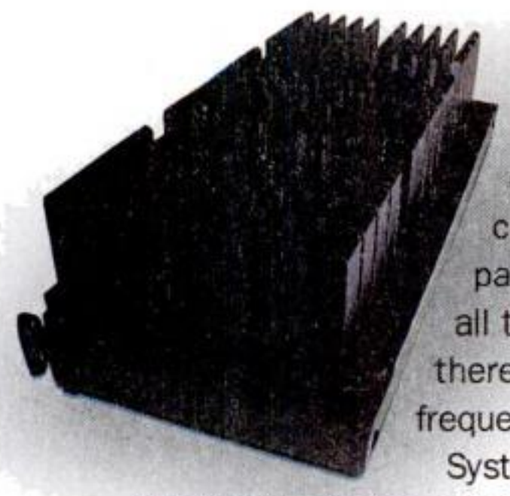
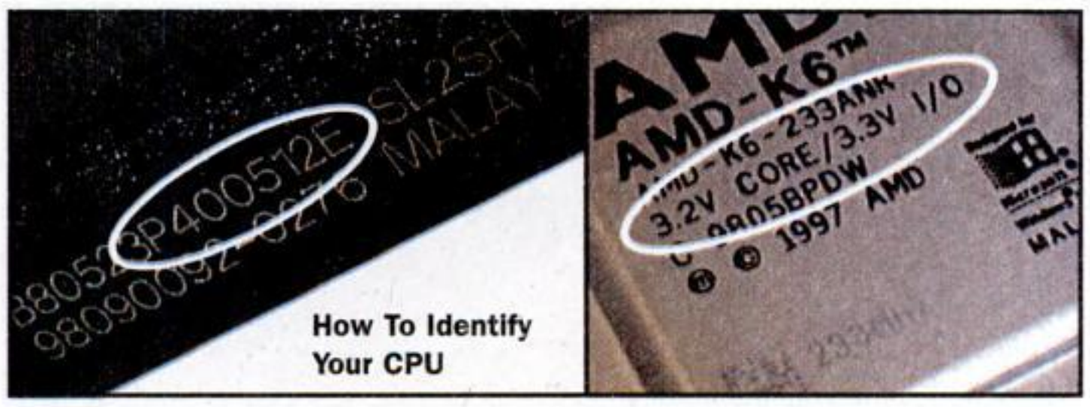


overclocking through the system bus is completely out of the question. But even if a particular motherboard comes equipped with all the oddball system-bus speed settings, there's still no guarantee you can run it at those frequencies.

System RAM and its ability to handle faster bus frequencies is also a factor. Although many PC100 SDRAM modules are spec'd to run faster than 100MHz, some aren't. Buying from a reputable, big-name memory vendor may hurt financially, but if you plan on taking your system to the limit, it's probably worth the investment. Remember, you'll be pushing your memory bus (and anything hooked up to it) as fast as it can go, so it may pay to invest in better RAM that exceeds the PC100 spec.




How To Identify Your CPU

On the left, note the circled number after the letter P. The 400 tells you that it's a 400MHz CPU, while the 512 means you have 512K of L2 cache. On the right, core voltages are clearly seen on AMD's K6 CPU.

## *The core-voltage connection*

When a CPU's system-bus speed is cranked up, it causes the processor to run harder. Sometimes, the increased workload may cause the CPU to need more power. Here's where you may want to start playing with the internal core voltage setting.

Electronics work to a specific rating with a small percentage leeway either way. If, after overclocking, you notice your system locking up after 20 minutes, it may be a signal to increase your core voltage a hair.

**Warning: You can easily fry its delicate innards with a misplaced setting. Increase your core voltage at your own risk.**

The tricky part of this is making sure that you don't feed your CPU more voltage than is necessary. The best way to ensure CPU livelihood is to gently push the voltage up in 0.1 increments (such as taking 2.2 volts to 2.3 volts). Check CPU specifications on the manufacturer's web site to be sure of your settings.

The charts here show the most recent CPU voltages for both Slot 1 and Socket 7 processors.

After changing the voltage speed, put your system through its paces. A great way to test is to start *Quake II* or *Unreal* and let the looping demo run. Try letting it run overnight to see if your system is stable enough for the long haul.

### SLOT 1 CORE VOLTAGES

| CPU | CORE VOLTAGE |
|---|---|
| Pentium II 233MHz | 2.8 |
| Pentium II 266MHz | 2.8 |
| Pentium II 266(Deschutes) | 2.0 |
| Pentium II 300MHz (old) | 2.8 |
| Pentium II 300MHz (Deschutes) | 2.0 |
| Pentium II 333MHz (Deschutes) | 2.0 |
| Pentium II 350MHz | 2.0 |
| Pentium II 400MHz | 2.0 |
| Pentium II 450MHz | 2.0 |
| All Celerons | 2.0 |
| All Xeons | 2.0 |

### SOCKET 7 PROCESSOR VOLTAGES

| INTEL PENTIUM | VOLTAGE I/O | CORE VOLTAGE |
|---|---|---|
| 100MHz | 3.38 | |
| 133MHz | 3.52 | |
| 166MHz | 3.52 | |
| 200MHz | 3.52 | |
| **INTEL PENTIUM MMX * DUAL VOLTAGE CPU** | | |
| 166MHz | 3.3 | 2.8 |
| 200MHz | 3.3 | 2.8 |
| 233MHz | 3.3 | 2.8 |
| **AMD K5** | | |
| PR100 | 3.52 | |
| PR133 | 3.52 | |
| PR166 | 3.52 | |
| **AMD K6 * DUAL VOLTAGE CPU** | | |
| 166MHz | 3.3 | 2.9 |
| 200MHz | 3.3 | 2.9 |
| 233MHz | 3.3 | 3.2 |
| 266MHz | 3.3 | 2.2 |
| 300MHz | 3.45 | 2.2 |
| **AMD K6-2* DUAL VOLTAGE CPU** | | |
| 266MHz | 3.3 | 2.2 |
| 300MHz | 3.3 | 2.2 |
| 350MHz | 3.3 | 2.2 |
| 366MHz | 3.3 | 2.2 |
| 380MHz | 3.3 | 2.2 |
| 400MHz | 3.3 | 2.2 |
| **CYRIX 6X86/6X86L** | | |
| 6x86 PR166 | 3.5 or 3.3 | |
| 6x86 PR200 | 3.5 or 3.3 | |
| 6x86L PR166 | 3.3 | 2.8 |
| 6x86L PR200 | 3.3 | 2.8 |
| **CYRIX M-II (AKA 6X86MX)** | | |
| PR200 | 3.3 | 2.9 |
| PR233 | 3.3 | 2.9 |
| PR266 | 3.3 | 2.9 |

Slot 1 owners have a much tougher road, since the majority of motherboards out there don't allow core-voltage adjustment. So many CPU settings have been taken over by the motherboard's core-logic chipset and BIOS that it's a rare Slot 1 board that allows core voltage adjustment.

## *Cooling it down*

Remember to give that overclocked CPU as much cooling as possible. Forget the lonely heatsink: go for a fat heatsink/fan combo. Most ATX motherboards place the CPU very close to the ATX power supply fan in order to ensure greater airflow across the CPU. AT formfactor owners will just have to make sure that CPU's protected by conventional heatsink/integrated fan means.

Some companies, such as KryoTech, have gone the extra cooling mile by designing a "phase-change refrigeration" system. For a look at what this system can do, take a peek at this month's preview of the KryoTech Cool K6-2 on page 73.

## *The beauty of overclocking*

An overclocked CPU is a joy forever. Even though there are many dangers involved in overclocking, and your warranty is almost always void by the time you're done with it, taking your hardware to the limit has payoffs that are both tangible and sublime. Once you've reached stability at the clock speed of your dreams, you'll enjoy your handiwork for years to come.

Read on and join Technical Editor Sean Cleveland as he takes you step-by-step through how easy overclocking can be.



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# How to Overclock

*Rumors abound of how chip manufacturers (especially Intel) conservatively rate their CPUs, filling orders with lower-marked chips due to overstocking of higher-rated chips. Another popular myth tells how a CPU is first tested at its maximum speed and then each successively lower speed until a reliable mark is reached, at which point they are labeled. Regardless of the truth, many people have found that they can significantly boost their system's performance by overclocking their CPUs.*

*To overclock your CPU is to push it beyond the speed originally intended by the manufacturer. It is neither recommended nor supported by any system or CPU manufacturer, and if you fry your CPU while overclocking, your warranty will be voided and you'll be left with an inoperable hunk of silicon.*

*You've been warned, but if you're ready and willing, read on.*

*—Sean Cleveland*

**For a rundown of different CPUs, how they work, and what voltages and speeds are the most successful for overclocking, refer to the Overclocking White Paper on page b4. It covers Intel's 300MHz Pentium II processor with the S-spec (SL2W8), the infamous Celeron 300a, and a bevy of other overclockable processors.**

## STEP 1

*Overclocking caveat*

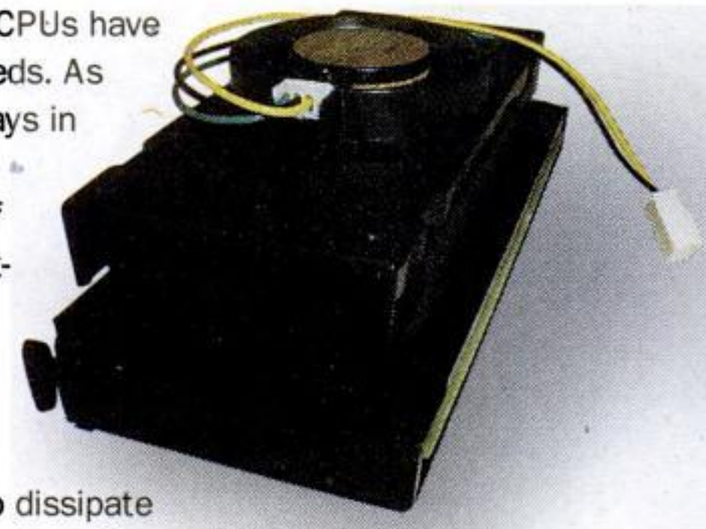
Do not overclock your CPU if you work with sensitive or vitally important data, since you could experience subtle problems, such as floating-point calculations being slightly off. If stability's important to you and your job, mucking with your system clock isn't a good idea. *Maximum PC* takes no responsibility for any damage or injuries that may result from your overclocking pursuits.

The small die sizes of today's CPUs make it dangerous to push the amount of electricity supplied to them. Side affects most certainly include increased heat that can lead to electromigration.

As always, don't forget to ground yourself when working inside your computer. Static electricity will kill your motherboard if you accidentally discharge inside your case. A grounding strap that connects your wrist via a wire to a metal surface is best. If you don't have one of these, touching any metal surface prior to touching jumpers, pins, or switches on the motherboard will also ground you.

## STEP 2

*Keeping your cool*



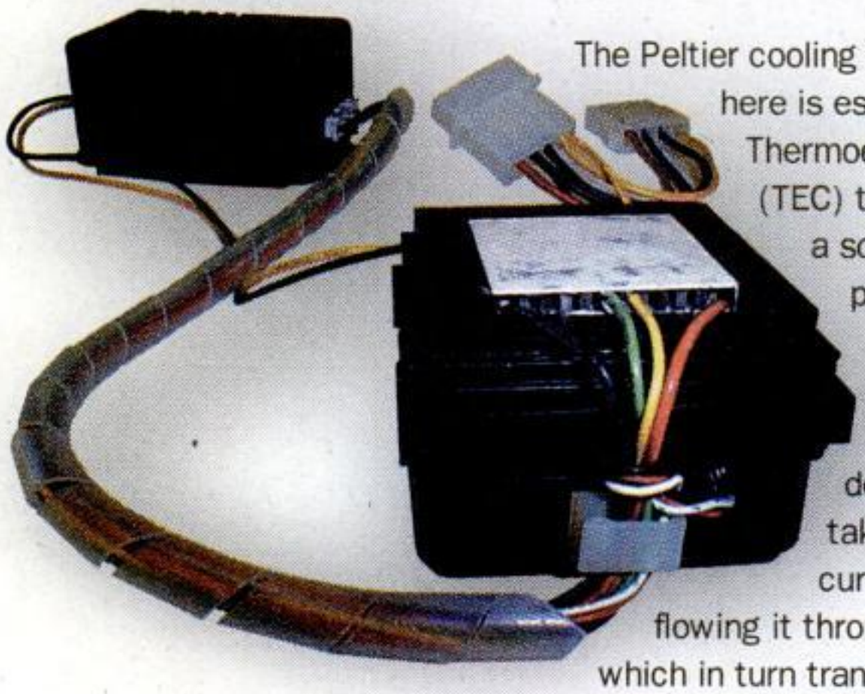
Heat is the number-one reason CPUs have problems running at higher speeds. As electrons flow along the pathways in the CPU, some of the energy is transformed into heat by way of resistance. The increased resistance slows the CPU's internal pathways and causes unreliable data returns and lock-ups. Adding a heatsink to pull heat away from the CPU and a fan to dissipate excess heat increases your chances of overclocking successfully.

You can also minimize heat through software. Believe it or not, the "Suspend on HLT" feature that most modern CPUs contain is not supported in Windows 95/98. OSes that support this feature allow the CPU to be suspended, thereby reducing heat generated when the CPU is sitting idle. Some small shareware companies have written apps to do this, including *Waterfall Pro* and *CPUIdle*.

You may also consider adding thermal paste between the CPU and heatsink. The connection between the two is far from seamless, and the vibration of heatsink fans don't help. The addition of a small layer of this paste guarantees a solid connection and helps conduct heat into the heatsink. If you're not sure where to find these types of products, check out the Heatsink Guide at **www.heatsink-guide.com**.

## STEP 3

*Your number-one fan*



The Peltier cooling fan shown here is essentially a Thermoelectric Cooler (TEC) that consists of a solid-state heat pump that utilizes the Peltier effect. It does this by taking DC current and flowing it through the TEC, which in turn transfers the heat from one side to the other. It creates a hot side and a cold side that can have a temperature difference of up to 70° C. When used in conjunction with a fan, the Peltier cooler is an overclocker's dream.

Additional fans inside the case will also facilitate airflow. Ball-bearing fans are always a good bet, since they run smoother, longer, and more silently than a standard fan. The golden rule of heatsinks and fans is the bigger the better.



For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.

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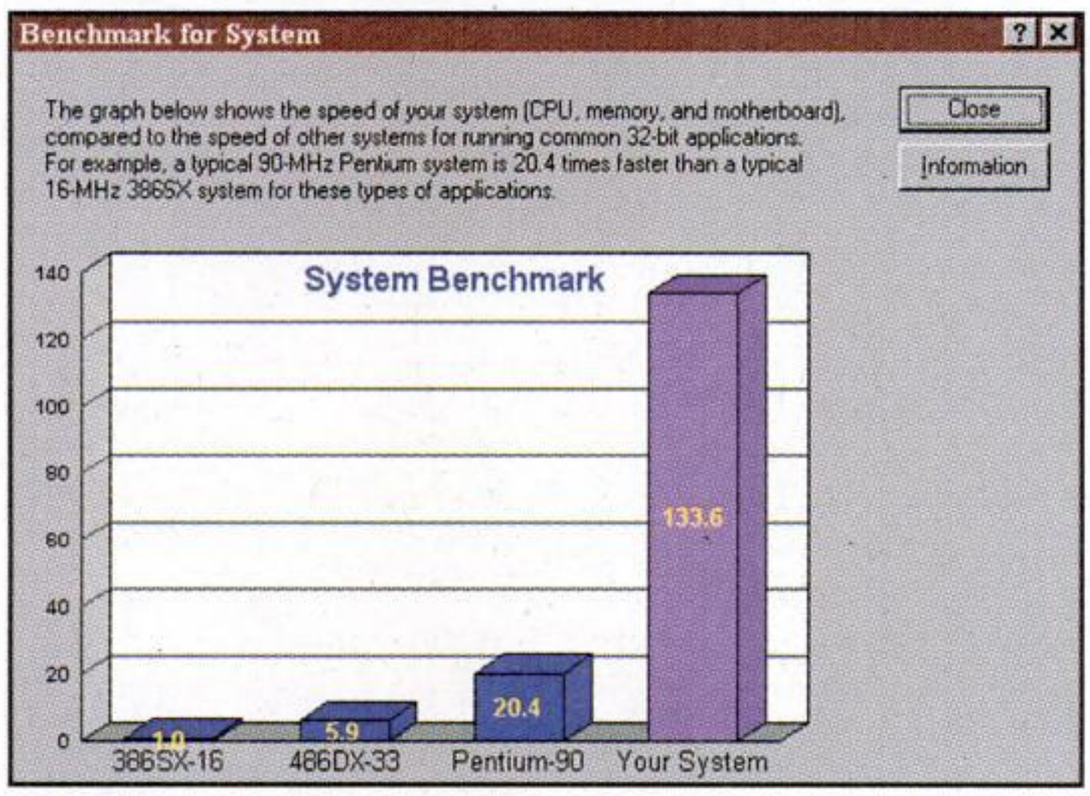
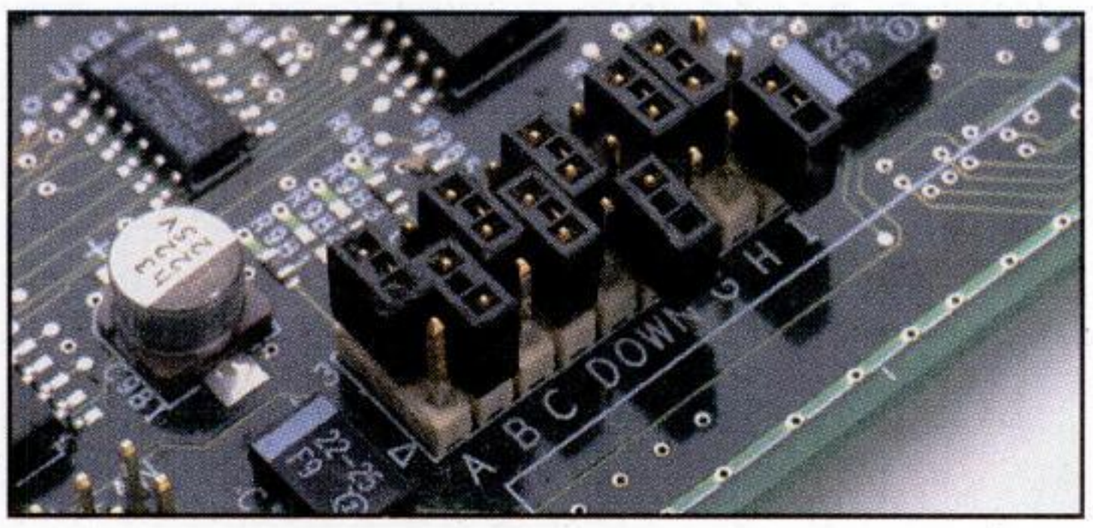
## STEP 4
### Setting the baseline




Benchmark your PC with its current settings so you can compare the results with overclocked scores later. This is a good way to find out if you've achieved the speed increase expected from overclocking and may even lead you to return the CPU back to its original speed. Why push it harder than you need to? We include most of the benchmarks we use for testing on the Maximum CD. Check out our web site (**www.maxiumumpc.com**) for our Benchmarking 12-Step.

## STEP 5
### Jumpers and switches

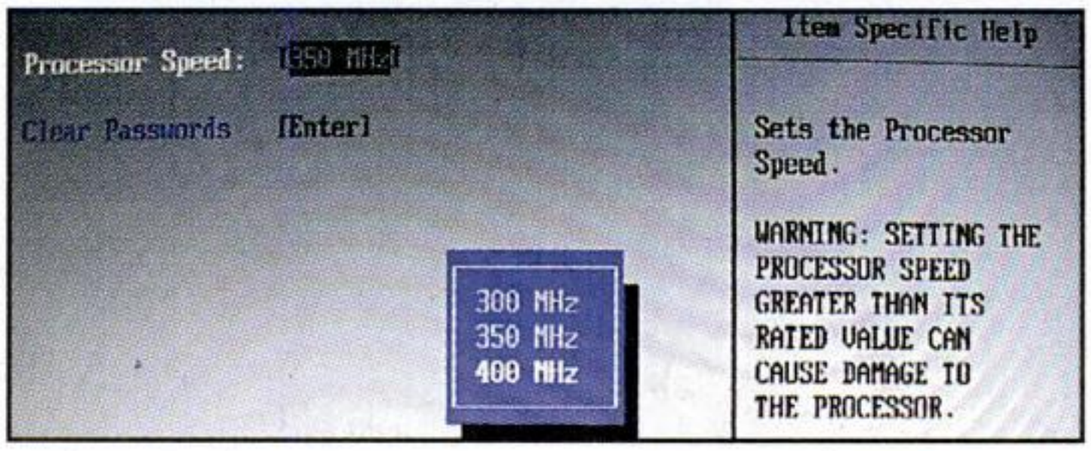



Most good motherboards have charts printed directly on them that explain which jumpers or switches do what. Jumpers are usually labeled jp#, where "jp23" is jumper 23. Switches are usually labeled similarly, but with an "sw" label.

Motherboard jumpers are normally in two- or three-pinned configurations. Two-pinned jumpers are closed when the jumper block is on the pins and opened when it's off. Three-pinned jumpers either are open or need the jumper block to be on pins 1 and 2, or 2 and 3. Pin #1 is usually noted in the manual and marked directly on the motherboard with a "1" or a small arrow next to the designated pin.

Switchboxes are plastic boxes with on and off switches. While these boxes tell you which switches to set for any given CPU speed, the multiplier and bus settings they control aren't usually labeled as such. Most good motherboard manufacturer web sites have these settings if the motherboard and manual don't.

## STEP 6
### An overclocking strategy




It's crucial to write down the original motherboard and BIOS settings prior to making changes, especially if you've never fiddled with them before. All motherboards are made differently; some contain multiple sets of jumpers, some switchboxes, and others a single jumper that enables BIOS control over these settings. Some are totally jumperless and control all settings via the BIOS.

You can inadvertently knock a wire loose or break something if you don't know what you're looking for on your motherboard. It's best to check the manual or your motherboard manufacturer's web site first to find pin configuration charts and jumper positions on your motherboard. You may have to look at the motherboard itself to find this and ultimately to figure out how to physically overclock the CPU.

Try to resist the urge to make changes to your motherboard while you're recording settings. It's best to first learn how much control your motherboard offers before overclocking your system. We recommend pushing the bus speed first, since this delivers the overall best results. Use the chart below to help devise a strategy.

| | 60MHZ | 66.8MHZ | 75MHZ | 83.3MHZ | 100MHZ | 112MHZ | 133MHZ |
|---|---|---|---|---|---|---|---|
| **2x** | 120MHz | 133MHz | 150MHz | 166MHz | 200MHz | 224MHz | 266MHz |
| **2.5x** | 150MHz | 166MHz | 188MHz | 208MHz | 250MHz | 280MHz | 333MHz |
| **3x** | 180MHz | 200MHz | 225MHz | 250MHz | 300MHz | 336MHz | 400MHz |
| **3.5x** | 210MHz | 233MHz | 263MHz | 290MHz | 350MHz | 392MHz | 466MHz |
| **4x** | 240MHz | 266MHz | 300MHz | 333MHz | 400MHz | 448MHz | 532MHz |
| **4.5x** | 270MHz | 300MHz | 338MHz | 375MHz | 450MHz | 504MHz | 599MHz |
| **5x** | 300MHz | 333MHz | 375MHz | 415MHz | 500MHz | 560MHz | 665MHz |
| **5.5x** | 330MHz | 366MHz | 412MHz | 457MHz | 550MHz | 616MHz | 732MHz |

## STEP 7
### Check your BIOS

Some motherboards come bare-bones without the necessary jumpers or switches to allow adjustments to the CPU multiplier or system-bus speed. Often they'll contain one setting either on the motherboard or in the BIOS that determines the overall speed of the CPU. Adjusting this setting will overclock the chip.

Some motherboards hide the BIOS setting for the CPU speed with a motherboard jumper. Removing the jumper opens up the section of the BIOS where the multiplier and bus-speed settings are kept.

When overclocking through your BIOS, keep in mind that your motherboard is changing the multiplier and bus-speed settings for you automatically. Make sure you don't decrease the bus speed while overclocking the speed of the processor. This can happen if you are increasing the CPU speed from 266MHz to say 270MHz. The CPU may run faster, but you'll have inadvertently decreased the bus speed from 66MHz to 60MHz, which will slow down your PC overall.



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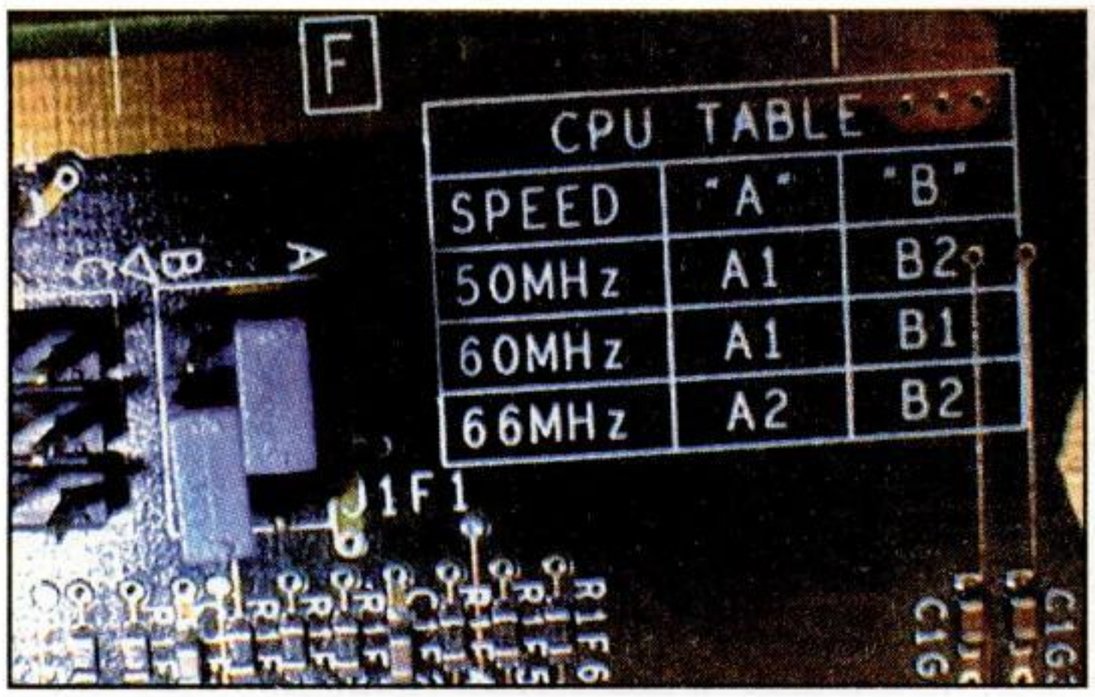
## STEP 8

*Set your multiplier*




Locate the jumper or jumpers that control the motherboard's clock speed. Change the setting by increasing it to its next highest speed. Refer to the Processor Speed Chart on page b7 for the next highest setting. Be cautious about jumping too high. It's safe to assume that if you own a Pentium II up to a 333MHz, you're system bus is running at 66.8MHz. Most Pentium II machines sold in the 350MHz and above categories run at 100MHz. So to overclock a 266MHz Pentium II to 300MHz, you would increase the multiplier setting from 4 to 4.5.

If the CPU is locked, meaning the manufacturer made it so that it can't be overclocked, you can take advantage of the procedure in step 9. Often the chip only detects the multiplier setting and not the bus speed, which can also increase its speed. So if you can't bump up the multiplier, just put the jumper back to the original setting and go to step 9.

## STEP 9

*Set your bus speed*

Increasing the frontside bus (FSB) speed yields the biggest performance gains. The FSB connects the CPU to main memory (RAM), the system chipset, PCI devices, the AGP card, and other peripheral buses. Increasing the FSB setting has a cascading effect on the performance of the rest of the system.

You'll want to change the bus setting to the next highest speed. For example, if it was set to 66 try 75. If it was set to 100 try 112. If you experience a lockup, it can usually be attributed to the CPU or memory. The best RAM currently is 100MHz SDRAM, since it's spec'd to run at 100MHz and beyond. Older RAM may not cut the mustard, and pushing the bus with older RAM on board may be problematic even if the CPU is running fine.

Another drawback is that some devices may have problems keeping up (usually videocards). You may find that things run fine until you jump inside a game that's being powered by your 3D card. Try running the game without the 3D features turned on (in software mode). Does it work? If it does, you can assume that the card can't take the extra pressure of the bus increase. Look to step 10 for some solutions if this is the case.

## STEP 10

*Set your voltage*

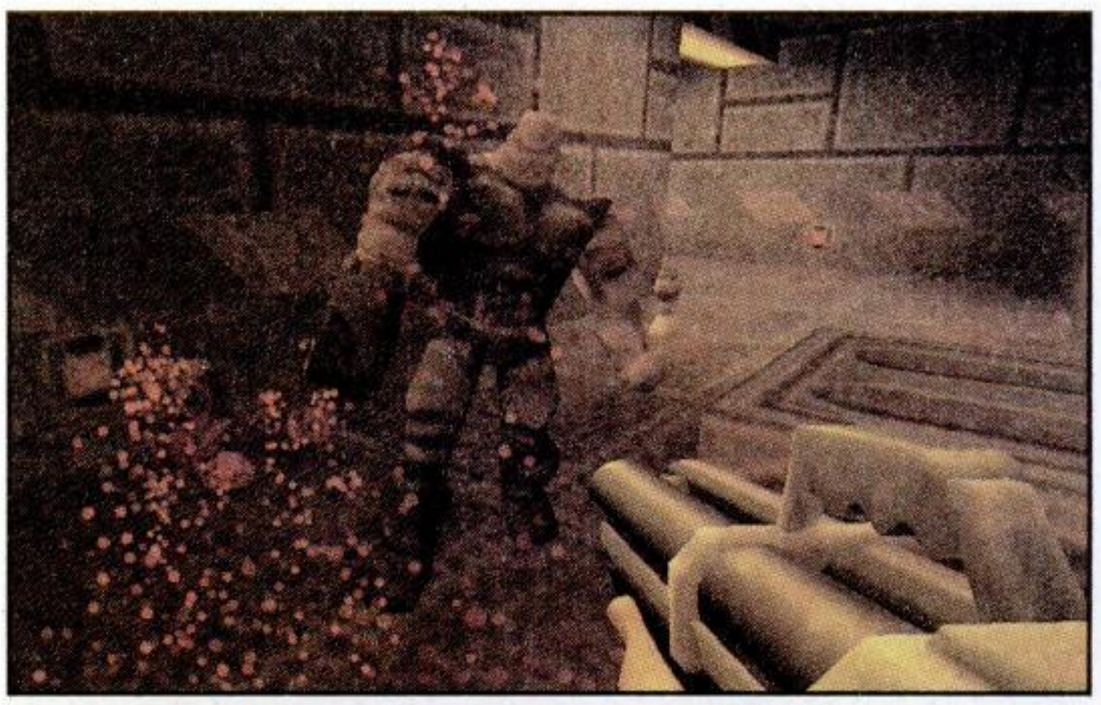
Another reason a CPU may not work at a higher speed may be due to an inadequate amount of voltage supplied to it. The chip may need just a little more juice for that extra oomph. Take time to consider your choices, because changing voltage settings can have detrimental effects.

Some of the better motherboards offer support for nonstandard voltage settings. The theory is that a CPU manufacturer might release a chip that requires one of these settings. With these non-standard voltage settings, you have room to find out whether the Intel or AMD chip you're trying to push may actually run better when the voltage is slightly increased. For several varieties of Celeron this is the case. Be aware that it's possible to set the voltage too high for a given frequency, especially when pushing the system bus.

There is more information about motherboard voltage settings in this issue's White Paper, so please read it before mucking with your settings.

## STEP 11

*Test it*



Running CPU-intensive software for a period of time is the surest way to check for glitches. These occur when some part of the CPU breaks down and can't return the necessary or correct data. We suggest running *Quake II* or some other game that stresses the majority of your PC's subsystems. You may also want to leave it on for an extended amount of time. If you notice lockups, errors in Windows, or any sort of problem, it can most assuredly be attributed to overclocking. Stepping down the chip may be the only solution.

## STEP 12

*Push it harder*

If you've successfully overclocked your PC you may want to try pushing it harder. The goal in overclocking is to wring as much performance out of your CPU as possible without compromising system integrity. The second golden rule of overclocking states that no speed increase is worth random system crashes. Use your best judgment. b



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# ULTIMATE OFFICE

## ▶ THE MAXIMUM PC GUIDE

The ultimate office is the high-tech worker's hideaway you've built at home. You have the perfect printer, the perfect scanner, and a videoconferencing camera to schmooze with the stiffs at command central. You're multitasking between two networked computers and running the best software around. This is the new corporate America, and it requires neither suits nor commutes. Read on as we name the best peripherals for small home offices.

**by Gordon Ung**

Joseph-Woo Design Desk, $3,820, from Kai-Yee Woo & Associates, San Francisco

PHOTOGRAPH BY JACK HUTCHESON



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# Printers | Multifunction Monsters

Hewlett-Packard OfficeJet 700

No matter how much we rely on e-mail and online file transfers, paper is still the lubricant that makes the world go 'round. Unfortunately, even though we might be able to rationalize away our reliance on dead trees, we still have to mitigate desktop real-estate shortages that are worse than the Manhattan housing market. This leaves small-office owners with some serious, Solomon-like decisions: Do you lose the fax machine and add a scanner, or do you eighty-six the copier to get a fax machine? No matter what, you still need a printer. Do you feel lucky, punk? Well, do ya?

The solution is to find a printer with extra functions. Our multifunction printer roundup grabs some of the most practical devices available today in the two mainstream reproduction technology categories—inkjet and laser.

Although some companies will try to sell you on the "laser-like quality" of inkjets, the two technologies are worlds apart. Inkjets rely on microscopic nozzles to spray, splatter, or shoot ink onto paper. While color inkjet technology has taken quantum leaps in photorealistic output, text quality won't look the same to people accustomed to, well, laser-sharp letters. With inkjets, paper quality greatly effects print quality, and of course there's the dreaded smear factor: When you run your hand across a printout fresh from an inkjet printer, you'll be left with a bunch of muck you wouldn't wish on your worst pair of painter pants.

Laser printers, which melt ink toner onto paper by heating the toner on a laser-etched drum, suffer the same problem they've suffered since they were invented: They're boring. It's just hard to get excited about straight black text and grayscale graphics. While color laser units have come down in cost recently, prices are still prohibitive for small-office use, and many low-cost color lasers can't compete with the color image quality offered by modern inkjets. Still, affordable black-and-white lasers do indeed offer the most professional text output in town, and no "laser-like" inkjet has closed the gap. So if you really want to impress the fiction editor of *The New Yorker* with a perfectly printed manuscript submission, go laser or go home.

And what about ribbon-based, dye-sublimation printers, such as the Alps MD-1000? Well, they offer fine image quality, but are still too slow to make sense for the ultimate office.

All of the following devices are basic parallel port peripherals. We would have preferred some USB support, but conservative printer divisions have been hesitant to embrace USB for the small-office market. Besides, parallel ports will persist in PCs for the foreseeable future, and something has to occupy them, right?

A final note before delving into our product recommendations: Before buying any multifunction printing device, check out a hard-copy example of its output and avoid anything that falls short of your print-quality expectations. Print quality will only degrade as your device grows older.

## ▶ HP OfficeJet 1175Cse

**$999, www.all-in-one-home.com**

The 1175Cse's older sibling, the 1150C, has long been an office favorite. HP improved upon the 1150C by adding a 30-page document feeder and fax capabilities to "Old Reliable." In all, the inkjet-based 1175Cse shows why we've always loved HP printers: With one chunk of cash, you can wipe out your needs for a printer, copier, scanner, and fax machine. But it's no petite boy-toy. At a burly 37 lbs., the 1175Cse is a hunk of print-lovin' that'll tower over your desktop.

The 1175Cse's scanning capabilities won't get you in the same ballpark (or even the same state) as Epson's 636 Perfection, but its 300x600dpi scanning should be enough for most jobs. In scan mode, the 1175Cse picks up millions of colors from its letter-sized bed.

Unfortunately, when you're a renaissance device, you have some weaknesses. The1175Cse's weak link is faxing. You can't turn off your PC and send faxes. Instead, the 1175Cse relies on your PC's fax modem. Faxing is also limited to black-and-white. Can we *really* say the 1175CSe even *has* a faxing feature?

Printing is HP inkjet standard-issue: 600x600dpi in black-and-white; 600x300dpi in color. PostScript fans will, of course, be left out. The 1175Cse counts on PCL3 to talk to your PC. Copying is the 1175Cse's strength. Normal black-and-white copies are rated at seven pages per minute. Color chugs down to one page per minute, but that's better than running to Kinko's and shelling out $2 a page. At 3,000 pages per month, the duty cycle is fully three times the capacity of the multifunction OfficeJet 700.

The software bundle includes a limited edition of Caere's *OmniPage*

PRODUCT PHOTOGRAPHY BY AARON LAUER



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OCR software, Adobe's *PhotoDeluxe*, KMT's *Office in Color*, and Symantec's *WinFax Pro*. About the only improvement we could think of shoehorning into the 1175Cse is a larger paper reserve. With only a 150-page capacity, you'll be reloading the versatile 1175Cse often.

## ▶ HP OfficeJet 700

**$499, www.all-in-one-home.com**

HP's OfficeJet 700 looks like a fax machine and smells like a fax machine, but functions as a low-cost inkjet printer, copier, scanner, and fax. HP boasts a long line of multifunction OfficeJets in the "fax machine formfactor," but the 700 is the first to offer color faxing capability. For overall features, the 700 doesn't compare to its cousin, the OfficeJet 1175Cse, but it'll save you $500 and a hunk of desk space.

The 700 stores up to 50 faxed pages in memory, and can receive and send black-and-white faxes while your PC is off. While HP touts it as an all-color machine, the OfficeJet 700 really needs your PC when it's sending or receiving color faxes. Bummer. A 14.4 Rockwell Group III modem is built into the unit, and it claims to fax about six black-and-white pages a minute. But if you're working with color, you must use your PC's modem. The OfficeJet 700 will accept 20 pages in its automatic document feeder.

If you go with the 700, you'll have to lower your scanning and copying expectations. You just can't get smashing scans out of a sheet-feeder when compared to a typical flatbed (and of course you can't scan or copy books, banana peels, and butt cheeks from a sheet-feeder, either). Scanning resolution is limited to 300x600dpi at 24-bit color. Print speed is rather slow, with black-and-white pages rated at 3.5 sheets per minute. Color printing slows to one page per minute.

An anemic 150-page-capacity paper tray (supporting both letter- and legal-sized paper) is standard. Bundled software includes Caere's *OmniPage* and Adobe's *PhotoDeluxe*. To help you scan odd-sized and delicate photographs, HP includes a sleeve to protect the photos.

Given its limitations, the OfficeJet 700 is the right device for users with modest requirements.

## ▶ Canon MultiPass C5500

**$449, www.ccsi.canon.com**

Canon's inkjet MultiPass C5500 is slightly cheaper than HP's OfficeJet 700, and presents an interesting set of trade-offs: You can't fax in color with the C5500, and you get a smaller, almost pathetic, 100-sheet cassette. But at 720x360dpi, you pick up slightly higher print resolution and get a larger automatic document feeder.

For some, the trade-offs may be worthwhile. In the multifunction department, the Canon can do full-color copies, and provides plain paper faxing with a 30-sheet document feeder. A Group III 14.4 modem handles faxing chores. Like the OfficeJet, the C5500 uses a 300dpi Contact Image Sensor (CIS) to scan documents. Scanning is at 360x360dpi in 24-bit color, and comes with a full set of TWAIN drivers.

The software bundle is similar to the OfficeJet 700 as well, giving you *Textbridge Plus* OCR and Adobe *PhotoDeluxe*. Canon also tosses in its *Creative Design Essentials*, a rudimentary image-editing and desktop publishing application.

For those who need a larger document feeder and higher resolution than the OfficeJet 700, the C5500 is the golden ticket.

## ▶ Canon BJC-5000

**$299/www.ccsi.canon.com**

If you're looking for unique paper sizes in an affordable "bubble jet" device, you have to consider Canon's MultiPass BJC-5000. "Bubble jet" is Canon's trade name for a different approach to inkjet technology. Similar to HP's "inkjet on demand" technology, bubble technology essentially heats up a bubble behind the ink nozzle, which then splats an appropriate amount of ink onto the paper.

Handling 11x17-inch paper at up to 146-pound thickness in its manual feed tray, the BJC-5000 gives home-office users a lot of flexibility for creative projects. In addition to accepting large paper sizes, Canon includes an odd twin-ink cartridge holder that reduces the number of printing passes required, which shortens print times. The dual carts push the BJC-5000 rating to 7.5 pages per minute in black-and-white, and 3.5 papers per minute in color. These are impressive speeds—when the printer actually hits them (times will vary).

With special paper, the BJC-5000 can print at up to 1440x720dpi, but on plain paper it's relegated to 720dpi. Near photo-quality output is aided by Canon's use of a seven-color system. Canon estimates that you can reach about 900 pages of text printout with the standard BC-23 black cartridge. With the twin

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HP OfficeJet 1175Cse

Canon MultiPass C5500

Canon BJC-5000

Sharp AL-1041

HP LaserJet J2100



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system, you should double your output. The estimate is based on 5% coverage, and, as is the case with car mileage, results will vary.

As far as the bundle goes, Canon simply drops in its *Creative Design Essentials* CD, along with some greeting-card and image-editing software.

## ▶ Sharp AL-1041

**$749, www.sharpelectronics.com**

Are you so niche-driven that you want the text clarity of a laser printer with a copier thrown in to boot? It sounds like you're jonesing for the Sharp AL-1041, a nifty little number that combines a 600dpi laser printer with a flatbed digital copier.

Digital copying can offer superior reproduction quality, especially when doing enlargements. Digital copiers are also theoretically more reliable than standard copiers because they boast fewer moving parts. And when making multiple copies, a digital copier will simply scan the image once instead of repeatedly scanning the same image. The AL-1041 holds up to 250 sheets in its tray, packs 6MB of RAM for printing chores, is rated for 10 copies per minute, and flatbed copies up to legal size.

The AL-1041 has two glaring holes: it has no scanning functions whatsoever and lacks a document feeder. A feeder is available on the Sharp AL-1020, but that device can't be used as a printer unless you buy a printer upgrade unit. Still, at a rated eight printed pages per minute, the AL-1041 offers the small office a powerful one-two punch as a laser printer/digital copier.

## ▶ HP LaserJet 2100

**$699, www.hp.com**

It's pretty hard to get excited about monochrome laser printers, but the output from HP's new 2100 can add a little step to your stride. Printing at its maximum resolution of 1200dpi, the 2100 adds a new dimension to monochrome printing for the cost of what a 300dpi laser cost just five years ago.

The 2100 also offers great expansion options. Running a large print job? Simply snap on an external 250-page capacity tray and fill it with letterhead. Need networking? Got it. PostScript? Sure. The 2100 even supports Jet Direct for use with notebook Fast IR ports, the new HP Capshare device (see page 54), and 3Com's PalmPilot.

A base, non-PostScript version of the 2100 comes with 4MB of memory. Up to 52MB can be added in three DIMM slots. Please note: The DIMMs are not standard 168-pin DIMMs, so you won't be able to swap system RAM into your printer (can you say proprietary memory gouge?). A 66MHz Intel 80960JD RISC processor sits in the heart of this beastie. HP says the 2100 can spit out its first page in about 17 seconds and hit 10 pages per minute at full resolution.

You can jam up to 350 sheets total in the 2100's two standard trays and, of course, there's the snap-on expansion tray. The monthly duty cycle is rated at 15,000—well above what you'll get with any inkjet, which translates into potential cost savings in the long run. HP predicts you'll get 5,000 pages out of a single toner cartridge. You can even print two reduced-sized pages on a single sheet of paper, which shouldn't lead to any legibility problems given the 2100's 1200dpi resolution (just make sure you have a magnifying glass handy to read the reduced type).

We would have preferred two parallel ports on a printer with such an extensive feature set, but the 2100 comes with only a single printer port and a LocalTalk port. Printer sharing will have to be done through your network. We love 1200x1200dpi printing for $699, but please note that the 2100 is not a multifunction device.

JetFax M900

## ▶ JetFax M900

**$1,995, www.jetfax.com**

So you *really* want it all. You want sharp text, digital copying, and faxing. JetFax's M900 offers all of this at the "low cost" of $2,000. The M900 has something for everyone: A 300dpi CIS scanner, a 300dpi digital copier, and a 600dpi LED printer.

Since this device is made by a company called JetFax, you know its strength will be faxing. And fax it does, with functions that read like a Ginsu commercial: 100 speed-dial buttons, 100 groups for fax broadcasting, a full 14.4 Group III fax modem, a 250-page output tray, and storage for up to 45 pages in memory with the ability to add RAM to store an additional 315 pages.

The M900 is an LED-based printer that uses stationary arrays of LEDs to focus and heat images on the drum. LED printers have fewer moving parts than other printers, and offer a crispness similar to laser output.

The 250-page paper supply is adequate, but overall print speed is a tad sluggish at a rated five pages per minute. A nice touch on the M900 is its multitasking: while the machine is copying or receiving a fax, the M900 will queue print jobs and complete them when the other jobs are done.

## MULTIFUNCTION PRINTERS: DARE TO COMPARE

| DEVICE | PRINT | FAX | COPY | SCAN | PRINT SPEED | PRINT RESOLUTION | SCALE | PRICE |
|---|---|---|---|---|---|---|---|---|
| **Canon BJC-5000** | Yes. BW/color | No | No | No | 7.5 in BW, 3 in color | 1440x720 BW/color on coated paper. 720x720 plain paper | N/A | $299 |
| **Canon C5500** | Yes. | Yes. BW/color | Yes. BW only | Yes. | 6.5 in BW, 2 in color 360x360dpi | 720x360 | 70% to 90% | $449 |
| **HP LaserJet 2100** | Yes. BW | No | No | No | 10 ppm | 1200x1200 | N/A | $699 |
| **HP OfficeJet Pro 1175Cse** | Yes. BW/color | Yes. Send only in BW | Yes | Yes. 300x600dpi | 9 in BW, 5 in color | 600x600 in BW. 600x300 in color | 25% to 400% | $999 |
| **HP OfficeJet 700** | Yes. BW/color | Yes. BW/color | Yes. BW/color | Yes. 300x300dpi | 5 in BW, 2 in color | 600x600 in BW. 600x300 in color | 50% to 200% | $499 |
| **JetFax M900** | Yes. BW | Yes. BW | Yes. BW | No. | 5ppm | 600x600 | 50% to 200% | $1,995 |
| **Sharp AL-1041** | Yes. BW | No | Yes | No | 8 in print mode. 10 copies per min. | 600x600 | 50% to 200% | $749 |



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# Flatbed Scanners

UMAX 2400s

Scanners aren't just for people with green hair anymore. Whether you're gathering art for a business proposal or running a booming porn web site, a flatbed scanner is a must-have in today's image-conscious world.

For this roundup, we chose to skip sheet-fed scanners, as well as scanners that rely solely on the parallel port interface. Sheet-feeders generally offer limp performance, and we wanted to avoid finicky conflicts with bi-directional, parallel port printers. SCSI is the interface of choice for speed freaks, but USB offers a flexible, easily installed alternative for those who don't mind slower scanning speeds.

Before you buy a scanner, you need to nail down your quality requirements. If you'll simply be scanning snapshots to post on your web site, even the cheapest 300dpi scanner do the job. If you're scanning images for a glossy, four-color brochure, you'll need much finer scan quality.

All the scanners in this roundup hit at least 600x1200 dpi, a resolution shared by all but the cheapest modern scanners. You should avoid advertised resolutions of 9600dpi or 19200dpi unless they're qualified as the scanner's optical, or hardware, resolution. Many manufacturers neglect to mention that the resolution is achieved via software interpolation—essentially algorithms that create the illusion of a higher resolution. It's marketing tomfoolery.

Color depth should also be considered; all good scanners support from 30- to 36-bit color depth. The number of bits refers to the amount of data used to hold information on every individual pixel. A 36-bit scanner will give you billions of colors. Some scanners interpolate color depth as well, so be skeptical of high bit-depth claims. For most people, 36-bit is more than adequate (and exceeds the support of many image-editing apps). Since even entry-level scanners now support 36-bit color, there's no reason not to get 36-bit.

New CIS (or Contact Image Sensor) scanners are becoming more popular, but we chose to avoid CIS technology in this roundup. Traditional CCD scanners rely on mirrors and a cold cathode tube to reflect images back to a fixed CCD. CIS scanners embed sensors in the actual scan arm to capture images. Although CIS scanners offer more consistent lighting and are less prone to alignment problems, CIS still has a ways to go in matching CCD technology for image quality and depth of field.

What about bundled software? Flatbed scanners, image-editing apps, and optical character recognition software go hand-in-hand-in-hand. All scanners in this roundup came with threadbare versions of popular image-editing and OCR software. Consider upgrading to full versions, especially for incredible OCR performance; you'll never need to re-type another document again.

Finally, when picking a scanner, consider the manufacturer's stability. Technology companies are hardly stable to begin with, but the rough-and-tumble scanner market is experiencing a shakeout that will continue through this year. Late last year, Visioneer got out of the hardware business to focus on OCR software, and Storm Technology shut down completely. Should you buy a Storm scanner on liquid discount? Probably not if you want future driver updates or need warranty work.

Epson 636 Perfection

AcerScan Prisa 620U

## ▶ UMAX 2400s

**$499, www.umax.com**

With one of the strongest software bundles in town and a luxurious legal-sized scanning bed, UMAX's 2400s steps up to the plate for people who have heavy professional requirements. The scanner ships with a generic SCSI card, as well as full versions of Adobe *Acrobat 3.0* and *PageMill* for both PC and Mac. Truncated versions of Adobe *Photoshop 4.0* and Caere *OmniPage* round out the software bundle, making this scanner a good choice for beginning designers. With an optical resolution of 600x2400, the 2400s will give most users more than enough scanning power. The 2400S is expensive considering the document feeder is optional, but the software bundle and solid performance mitigate the price.

## ▶ Epson 636 Perfection

**$299, www.epson.com**

Business professionals looking for that perfect marriage of high scanning



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## SCANNERS: DARE TO COMPARE

| SCANNER | BED SIZE | INTERFACE | OPTICAL RESOLUTION | COLOR DEPTH | PRICE |
|---|---|---|---|---|---|
| **AcerScan Prisa 620U** | Letter | USB | 600x1200 | 36-bit | $99 |
| **Epson 636 Perfection** | Letter | SCSI | 600x2400 | 36-bit | $299 |
| **Hewlett-Packard 6250Cse** | Letter | USB/SCSI | 600x1200 | 36-bit | $499 |
| **UMAX 2400s** | Legal | SCSI | 600x2400 | 36-bit | $499 |

quality and a small footprint will want to look at Epson's Perfection. Epson groomed this package well and includes two sets of TWAIN drivers optimized for either general scanning or artistic work. The LaserSoft drivers install a scanning control panel that affords great tweakability. The bundled PCI SCSI card is a no-frills Adaptec 2910B, but is more than sufficient for most uses. Like the UMAX, the 600x2400 Epson uses microstep motors to creep the scan arm to-and-fro, giving it a higher optical resolution than either the HP or Acer. The 636 Perfection consumes the least desk space of any scanner here and throws in a face-plate button for one-touch scanning/copying.

### ► Hewlett-Packard 6250Cse

**$499, www.hp.com**

Think of HP's 600x1200 6250Cse as a jack-of-all-scanning-trades. Equipped with a 25-page capacity sheet feeder, HP tosses in a cheesy, triangular 35mm transparency adapter as well. The 6250Cse swings both ways, too: you get a SCSI interface for fast scanning speeds and a USB interface that saves you from cracking open your computer. If you're planning on running multiple peripherals, be aware that the 6250Cse has only a single SCSI port; it'll always have to be the last link in your device chain. The scanner comes with a USB cable; if you want to take advantage of the SCSI port, you'll have to pony up for a SCSI card and cable. Of all the scanners in this roundup, the 6250Cse offers the most hand-holding for beginners: scanning wizards, one-button scanning, drag-and-drop scanning—basically, three different ways to skin the same cat. Adobe's stunted but functional *PhotoDeluxe Business Edition*, Caere's *PageKeeper Standard*, and a suite of HP scanning software round out the package.

Hewlett-Packard 6250Cse

### ► AcerScan Prisa 620U

**$99, www.acerperipherals.com**

Can you really complain about anything that costs $99? With the 620U, you get a small software bundle—Ulead *iPhoto Plus*, a "classic" version of Xerox's *TextBridge* OCR software, and MiraScan TWAIN drivers—but at least the optical resolution is 600x1200. The TWAIN drivers are functional but not as full-featured as the Epson 636. The 620U is a USB device that promises full compatibility with not only Windows 98, but Windows 95 OSR2.1. And at this price, it's probably the best scanner around for simple web page projects.

# Hands-On Scanning

### ► Hewlett-Packard Capshare 910 Information Appliance

**$699, www.capshare.hp.com**

Hewlett-Packard estimates the average business professional sends nearly $164 worth of faxes per month while on the road. That's why HP minted the Capshare 910. Our first inclination is to say, "Who cares how much you spend on faxes? It's a billable expense!" But the real reason to buy the Capshare is to mate it with your Nokia 9000i Communicator.

Reminiscent of Reagan/Bush era hand scanners, the Capshare can capture up to 50 pages in grayscale and squirt them via IrDA to your notebook for modem-faxing or e-mailing. Scans can be previewed on the unit's LCD screen. And when paired with the Nokia Communicator, scans can be sent immediately, on-the-spot, after scanning. Images sent to your notebook appear as Adobe *Acrobat* PDF files that can be faxed or e-mailed.

The Capshare supports both Fast IR at 4Mbps and Serial IR at 115Kbps. Those without IR ports can use a supplied serial cable to tether the Capshare to a notebook. On a set of Nickel-Cadmium batteries, the Capshare can scan 50 pages. HP supplies four Ni-Cads, but mobile warriors will be furious to learn the Capshare isn't compatible with alkaline batteries. Other problems include awkward button placement, and difficult wrist motions required to make a full-page capture. We also would have appreciated less friction when passing the Capshare over paper. Our handmade, preproduction model felt more like a Black and Decker hand-sander than any kind of HP device we've ever encountered.

Otherwise, the Capshare's controls are simple and intuitive to use. The price may be a killer, but the Capshare's usefulness is beyond question.



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# Silicon Schmoozers

## ▶ Business card readers put handshakes on hard drives

Traditionally, there were only two ways to tackle that 8-inch stack of business cards that's been growing moldy on your desk: throw it away, or pay someone to hand-enter all the cards into a database. But now there's a better way: load the cards into a special scanner that quickly shuffles names, addresses, and phone numbers into all the appropriate database slots.

We put the two top business card scanners in a head-to-head competition. The winner? Corex's Cardscan tromped the Seiko Smart Business Card Reader in all categories but style. It commands a steep price, but if contact information is important to your business, the Corex scanner is worth the investment.

The two units featured here need three improvements: a USB option, color scanning, and a way to load in numerous cards for batch scanning (it's a real drag loading all those cards one-by-one). Unfortunately, these enhancements might send prices through the roof.

Seiko Smart Business Card Reader

Corex CardScan Executive

### ▶ Corex CardScan Executive

**$259, www.cardscan.com**

Corex's CardScan Executive carries Cadillac pricing with the style of a Yugo. But don't let its Cold War Soviet styling fool you into thinking it doesn't perform. The Executive chews through business cards faster than a wood chipper.

The Corex wisely features a parallel port pass-through, something Seiko neglected to throw in. Cards are auto-detected and scanned without user intervention. Besides ugly styling, the only complaint about the scanning unit is excessive heat build-up. This is one device you'll want to power down overnight.

Between the two units, the CardScan Executive offers the more up-to-date software in *CardScan 4.0*. This revision ups Corex's robust connectivity with ActiveSync support for Windows CE units.

In a scanning test of 83 business cards, the CardScan offered better accuracy and more uniform output than the Smart Business Card Reader. Scanned text is placed in a standardized format on the Corex. For example, all phone numbers are formatted as (###) ###-####.

While the CardScan was consistently more accurate than the Smart Business Card Reader, it did have problems recognizing underscore marks in e-mail addresses and was unable to process reversed white text on black business cards. It did handle off-color and thick business card with less trouble than the Seiko, though. Neither unit was able to capture text embedded in logos or graphics very well.

In this two-horse race, the CardScan easily wins in accuracy, features, and software strength. People may confuse a CardScan for a cheap tabletop paper shredder, but they won't laugh after seeing it process a stack of cards in a few minutes.

### ▶ Seiko Smart Business Card Reader

**$199, www.seikosmart.com**

Seiko must have had the desk of a yuppie in mind when it designed the rakish Smart Business Card Reader. The vertical card reader occupies less than half the desk space of Corex's CardScan Executive, and watching the Smart Business Card Reader in action is almost as fun as watching taffy being made.

It's too bad the fun ends there. The Smart Business Card Reader has several fatal flaws. The first problem is the accompanying antiquated 16-bit software. A full 32-bit application that should address the shortcomings is due by early 1999. We hope Seiko takes a whack at the hardware as well. The unit's lack of an auto-detect function makes batch scanning a chore; you have to push a button each time after inserting a card. Also missing is a parallel port pass-through.

In accuracy, speed, and recognition, the Seiko was a distant second to the Corex. Lightly colored cards and fades threw the Seiko for a loop, and the scanner gagged on cards with thick embossed logos and crumpled edges. However, even this level of accuracy beats out entering data by hand. Data isn't processed as carefully and scanned cards are taken at face value so SOMEONE'S NAME THAT'S IN UPPER CASE STAYS THAT WAY. If you're anal-retentive about your contact data, you may find yourself fixing more than you expected.

Connectivity to popular PIMs is present, and Seiko gives you an OEM version of the clever ProdEx software, but getting data to handhelds is more difficult and not suited to batch transfers.

The Seiko's second-place accuracy and geriatric bundled software leaves us with no choice but to recommend the Corex.

### CARD SCANNERS: DARE TO COMPARE

| SCANNER | SCAN TIME: 83 CARDS | CORRECT | EDITING REQUIRED | FLAT WRONG | PRICE |
|---|---|---|---|---|---|
| Corex CardScan Executive | 14:37 | 67 | 13 | 3 | $259 |
| Seiko Smart Card Reader | 21:40 | 57 | 14 | 12 | $199 |



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# Networking

SOHOware Network Fast

If you've outgrown a single PC and are tired of transferring files via sneakernet, it's time to network. In addition to making file transfers easier, a modest little network can save you from purchasing additional modems, printers, and removable storage drives for multiple machines. In short, every ultimate office needs a swift network injection.

This year should see a boom in small-scale networking. Last year, most small office networks were based on traditional big-office technology: 10BaseT or 100-BaseT Ethernet. This entails threading CAT-5 cabling from a machine to a hub or crossover—a daunting task that can mean drilling holes through walls and precious hardwood floors.

This year, vendors are selling easy-to-install home-networking products that eschew unwieldy cabling and instead use wireless transmission, your existing phone lines, and even electrical wall outlets to connect PCs at speeds up to 1.6Mbps. Using Tut System's HomeRun technology, upcoming products such as Diamond's HomeFree Phoneline will let you network machines without disrupting phone traffic. Even Intel will get into the action with its 21145 chip, a phone line/Ethernet chip that will sit directly on motherboards.

Even as you consider building a 1Mbps phone line network, 10Mbps products are in the launch chute. Since no 10Mbps standard has been ratified yet, upcoming 10Mbps products such as Epigram's iLine 10 may not fully cooperate with future 10Mbps phone line products. Epigram does promise backward compatibility with 1Mbps products, though.

Wireless may be an even easier answer than phone lines. Using frequencies in the 900MHz and 2.4GHz range, wireless products convert data to RF packets, which are broadcast through your home. Standards wars are also being waged on the home wireless front. Expect to stick with a single product line if you buy today because interoperability hasn't proven to be much of a consideration for wireless vendors.

No matter what product you pick, a network is a must for any ultimate office.

## ▶ Diamond HomeFree

**$199–$239, www.diamondmm.com**

Diamond's HomeFree was one of the first 2.4GHz wireless network products available. Working much like a cordless phone, HomeFree broadcasts data packets in a 150-foot diameter from each node. The high frequency provides more security and less interference than 900MHz, which is used by some cordless phones. Simply install a PCI, ISA, or PC card in any computer you want to network, and you're ready to go.

Offering speeds of up to 1Mbps, Diamond uses spread-spectrum frequency hopping to maintain network security. HomeFree supports up to 16 nodes; additional nodes can be added only by purchasing additional kits. Diamond's Desktop Pac ($199) comes with both an ISA and PCI card, and its Combo Pac ($239) comes with an ISA card and a PC card for your notebook. Single-node options range from $99 to $129.




Diamond HomeFree

Diamond chose to embed its transmission antennas on the end of the cards instead of running longer external leads. This shouldn't be a problem in most cases, but for those with metal desks it might.

## ▶ Proxim Symphony

**$149, www.proxim.com/symphony**

Another wireless, antenna-based proposition, Symphony attains better overall throughput (1.6Mbps) and offers more options than Diamond's HomeFree. Symphony's ISA card connects to a "rubber duck" antenna, which sits on top of your monitor for better reception. There is a PC card laptop option available for $199, but no PCI yet.

Like HomeFree, Symphony uses spread-spectrum frequency hopping for security. Although competitors say 2.4GHz microwave ovens will interfere in that range, both Diamond and Proxim believe frequency hopping will eliminate problems. Proxim doesn't offer any two-card bundles; each ISA node costs $149.

Proxim also offers a wireless Ethernet bridge to make cable, ISDN, and DSL Internet access available to all Symphony-rigged computers. Also, a wireless 56K modem ($299) can connect directly to the phone jack on your wall and transmit data packets to Symphony-equipped machines in rooms that lack phone jacks entirely.



Proxim Symphony



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## ▶ WebGear Aviator Wireless 900MHz

**$169, www.webgear.com**

Aviator is a low-cost, wireless technology that doesn't even require you to open up your computer and install an expansion card. Operating on the 900MHz band, the Aviator has a shorter range than new 2.4GHz systems, and since many cordless telephones also ride the 900MHz merry-go-round, you might experience interference.

An Aviator kit comes with two nondescript black boxes that plug into your PCs through their parallel ports. Speeds are rated at 1Mbps, but overhead drops access down to about 500Kbps. While you don't need to crack open your case to install Aviator, you will need to install the included parallel port card if you plan on connecting a printer to the same computer—there's no printer pass-through on Aviator boxes. Additional black boxes cost $89.

WebGear Aviator Wireless

Applica U2

Intelogis Passpost

## ▶ Applica U2

**$249, www.applica.com**

The U2 isn't a true networking technology, but rather an ISA-based video adapter that attaches to a connection box. The connection box attaches to a monitor, keyboard, and mouse. The end result? You can now have two monitors, keyboards, and mice attached to a single computer, enabling two simultaneous, independent work sessions. You share the same CPU, hard drive, and memory resources, but for all intents and purposes, you'll feel like you're on your own machine. Albeit with some limitations.

If you're the "second user," you won't have sound, and the U2 isn't compatible with all applications (Netscape *Navigator*, *Internet Explorer*, and popular office suites are supported, however). Also, if one user shuts down the machine while the other user is working, both sessions will stop. And of course, since you're sharing system resources, performance will bog down in demanding applications (Applica offers a 30-day money-back trial in case the performance drain ills you). The U2 supports Windows 95 and 98, but not NT.

Applica touts the U2 as the most inexpensive way to add a second PC to your life, and it may well be, though you have to buy an additional keyboard, monitor, and mouse. The U2 includes a 15-foot cable; a 50-foot cable is available for $49. The minimum recommended system config is a 166MHz Pentium with 32MB of RAM.

## ▶ Intelogis PassPort

**$199, www.intelogis.com**

In the coming year, a slew of products will enable networking through your phone jacks. But there's a problem with this technology: Few dwellings have a phone line in every room. Intelogis PassPort overcomes this dilemma by passing packet data through your home's electric grid at an incredible range of up to a quarter-mile.

The white-hot PassPort nodes plug directly into your electrical wall outlets, and then cable over to your PCs' parallel ports. As is the case with the Aviator, you lose the use of the parallel port on each PC, but Intelogis addresses this problem with a wall outlet module that plugs directly into your printer. This is a great way to move your printer from one end of your house to the other.

The PassPort's main weakness is speed. At a dismal 350Kbps, you'll be waiting a long time when transferring large files. A basic PassPort kit includes two PC nodes and one printer node for $199. Additional PC nodes cost $79; additional printer plugs cost $59.

## ▶ SOHOware Network Fast

**$159, www.sohoware.com**

Of all the products in this networking roundup, there's one glaring shortcoming: lack of bandwidth. For those who really need to communicate in a fast network setting, nothing says loving like genuine 100BaseT Ethernet. We'll eventually see phone line ports on PC motherboards and printers—yada, yada, yada—but in the here and now, a load of products are available for Ethernet LANs.

SOHOware's Network Fast has everything you need to build your own Ethernet network. Packaged in a single box are two PCI 10/100BaseT cards, two 25-feet CAT-5 cables, and a five-port hub to support future node expansion. A user guide set to newbie-speed is included as well.

The only thing this kit doesn't include is a drill bit. Dollars-to-megabit, there's nothing currently cheaper than Fast Ethernet.

## NETWORKING: DARE TO COMPARE

| PRODUCT | CONNECTION | MAX RANGE | SPEED | PRICE |
|---|---|---|---|---|
| **Applica U2** | Hardwire | 15 ft. to 50 ft. | N/A | $249 |
| **Diamond HomeFree** | Wireless @ 2.4GHz | 150 feet | 1Mbps | $199 two nodes |
| **Intelogis Passport** | Electrical | Quarter-mile | 350Kbps | $250 two nodes plus printer port |
| **Proxim Symphony** | Wireless @ 2.4GHz | 150 feet | 1.6Mbps | $149 per node |
| **SOHOware Network Fast** | Hardwire | Determined by cable length. Two 25' CAT 5 cables included. | 100Mbps | $159 two nodes plus hub |
| **WebGear Aviator** | Wireless @ 900MHz | 125 feet | 1Mbps | $169 two nodes |



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# VideoConferencing

Video conferencing over 56K modems is just a cruel joke. Unless you have a high-bandwidth pipe—or are willing to live with choppy video and out-of-sync sound that makes Kung Fu Theater look like Shakespeare in the Park—realtime video conferencing isn't for you.

So what do inexpensive video-conferencing cameras have going for them? Instead of hopping on a plane to meet one-on-one, you can hand-hold your client through his latest crisis by video mail.

All the cameras here support the H.323 standard for video and sound exchange, precluding the need for proprietary videophone apps. For direct-dialup PC-to-video phone connections, you'll need a camera that supports H.324 and a modem that supports V.80 standards.

## ▶ Intel Create and Share

**$124, www.intel.com/createshare**

Intel says Create and Share is the most popular PC camera selling today—surprising given the camera produces the lowest-res images in this roundup. The appeal may come from the strong software suite that supports video phone calls, v-mail, still-image grabs, and even trippy interactive screensaver games.

On the hardware side, Intel chose to stick with a CCD-based camera and offload compression work to the processor. A snap to install and use, the Create and Share features a lens cover that doubles as an exposure setting. Image quality was first rate, but we couldn't hit the rated framerates.

## ▶ Xirlink C-It XVP710

**$99, www.xirlink.com**

Xirlink's C-It uses its Video Compression Engine chip to compress video before sending it down. On our 400MHz P-II, the C-It reached it's rated framerates. Under typical fluorescent office lighting, the C-It also produced more natural-looking images than other cameras.

The camera's weaknesses are a skimpy software bundle, no H.324 support, and no lens cover. Performance junkies may put the C-It at the top of the list, but its lack of direct-dial videophone support and light software bundle is disconcerting.

## ▶ Creative Labs WebCam II

**$99, www.creativelabs.com**

Using inexpensive CMOS technology instead of traditional CCDs, Creative's WebCam II suffered the worst image quality under low office lighting. The WebCam II isn't marketed as a video-conferencing or video-mail camera, and it shows in the software bundle, which simply includes applications for still image editing, videophone calls, and Internet spy cams.

The WebCam II folds down for privacy and boasts the sturdiest design in this roundup. Although its image quality was lacking, the WebCam II came through in framerates, reaching 30fps in QCIF resolution.

## ▶ Philips Image PCA645VC

**$99, www.pc.be.philips.com**

With a large quarter-inch CCD, the Philips turned in top-notch video and still captures. Eschewing the analog soundcard in your PC, the Philips captures audio with a built-in mike and sends it in pure digital format. The improvement? Not much. The software bundle concentrates on video capture and v-mail. H.323 Internet video conferencing is left to *Net Meeting*. Framerate performance was good, but not as good as the C-It or WebCam II. The package is really only marred by the lack of a lens cap.

Philips Image PCA645VC

Creative Labs WebCam II

Xirlink C-It XVP710




Intel Create and Share

## VIDEO CAMS: DARE TO COMPARE

| CAMERA | MAX VIDEO RESOLUTION | MAX FRAME RATE AT QCIF RES | MAX RESOLUTION STILL | H.323? | H.324? | PRICE |
|---|---|---|---|---|---|---|
| **Creative** | 352x288 | 30fps | 704x576* | Yes | No | $99 |
| **Intel** | 320x240 | 25fps | 320x240 | Yes | Yes | $124 |
| **Philips** | 352x288 | 24fps | 512x582 | Yes | Yes | $99 |
| **Xirlink** | 352x288 | 29fps | 704x576* | Yes | No | $99 |

*Software enhanced from 352x288 max resolution



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# Software

Software lies at the heart of any office experience. If you're looking for an upstart alternative to Microsoft *Office*, check out our reviews of Lotus *SmartSuite Millennium* and Corel *WordPerfect Suite 8* in the December 1998 issue. Both packages offer all the word-processing, spreadsheet, presentation, and calendar loving your tired heart can handle. Here we detail some of the quirky apps that pick up where the big office suites leave off.

## ► Lotus Organizer 5.0

**$87, www.lotus.com**

Now in its 5.0 version, Lotus's time-tested personal information manager has tightened connections to PalmPilots and the defunct Avigo PDA. Lotus also added data-conversion from other PIMs to *Organizer* format. Also new to *Organizer* is Internet-based meeting scheduling via the new iCalendar standard: Like a vCard attached to an e-mail, you can drag-and-drop an appointment file into *Organizer*. One caveat: Windows CE, Psion, and Rex connectivity is not provided and must be purchased through a third-party vendor. *Organizer 5.0* is no replacement for a full-blown contact manager such as Symantec's *Act!* or *Goldmine*, but it's a very good (and inexpensive) start.

## ► Norton SystemWorks

**$69, www.symantec.com**

You gotta like this bundle: For a mere 69 clams, you get *Anti-Virus 5.0*, *Utilities 3.0*, *CrashGuard*, and access to Symantec's Web Services—essentially all you need to keep your ultimate office running at full-strength. Symantec's Web Services offers driver updates and patches, and is really the beginning of a push for subscription-based software. Symantec also tosses in lite versions of *Visual Page*, *WinFax*, *pcAnywhere*, and *Remove-It 98*. SystemWorks offers better integration and polish than McAfee *Office*, but many of the titles in this suite are about to be revved up, so if you can wait a few months, it might be worth the wait. A professional version for $99 adds Norton *Ghost*, for hard drive cloning and backup, and Norton 2000 for checking the compliance of your applications with the Y2K bug.

## ► McAfee Office

**$99, www.mcafee.com**

McAfee—the *other* utility suite. But certainly not a bad package. McAfee *Office* includes *VirusScan*, *Nuts and Bolts 98*, *First Aid*, *UnInstaller*, *Hurricane*, *Oil Change*, *2000 ToolBox*, *GuardDog*, and *PGP Security*. We would like to have seen stronger integration. In fact, at times it seemed there was no integration whatsoever, at least judging from the installation paths taken by some of the programs. Like SystemWorks, McAfee *Office* suffers from "classic title fatigue." On the flipside, it offers certain elements (such as its PGP support) that aren't available in other utility suites.

## ► Caere OmniPage Pro 9.0

**$99/$499, www.caere.com**

If you haven't used optical character recognition software in a while, you don't know what you're missing. Accuracy has improved enough for Caere to make good on its bold claim of 99% precision in its 9.0 version. The latest version of *OmniPage* also ups the number of languages recognized to 13. Unlike the lite edition bundled with scanners, *Pro 9.0* will retain the original formatting of a scanned document and let you tweak the output as it scans it in. Caere also lets you link *OmniPage* to Microsoft *Word*'s dictionary, something people have wanted for ages. The full version runs a painful $499. The cheap way out is to buy the upgrade version for $99. It'll upgrade any lite Caere OCR software that came with your scanner.

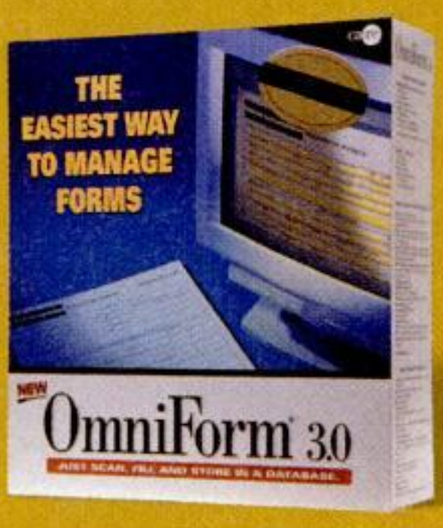
## ► Caere OmniForm 3.0

**$149, www.caere.com**

Got your 113/23-F form? *OmniForm 3.0* is scanning software that takes hard-copy forms and converts them to an electronic format, even retaining the original graphics. Need to have someone fill out a form electronically? Just "*OmniForm*-it," create a self-executing file, and e-mail it to the person. After he or she has filled it out and returned it, you extract the data to your ODBC-compliant database, such as *Access* or *Excel*. Voilà. No muss, no fuss. If your business is forms-based, *OmniForm 3.0* is a must.

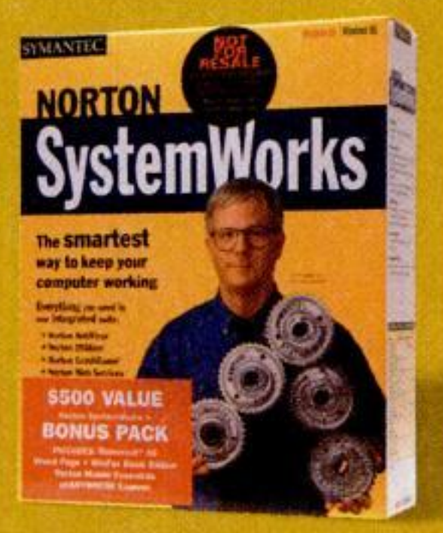
Caere OmniPage Pro 9.0

McAfee Office




Caere OmniForm 3.0

Lotus Organizer 5.0




Norton SystemWorks



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SONY

By all means, think outside the box. Just put it all back when you're done.

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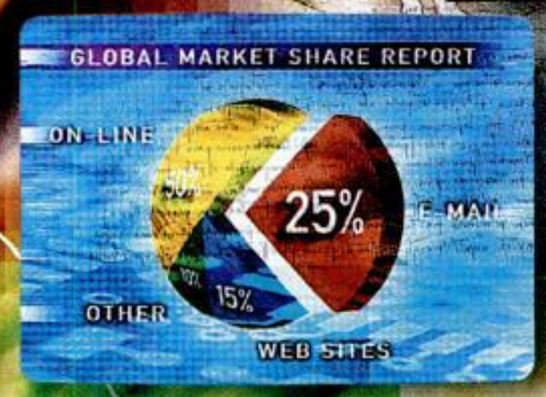
Introducing the HiFD™ system by Sony.
The new floppy disk and drive that let
possibilities have priority over limits.




Imagine a single HiFD disk with room for
140 of the floppies you're using today. That's a
lot of pie charts, presentations, graphics
or anything else you'd like to download or save.

Now imagine a drive that plays back at near hard drive
speeds and still works with your old floppies.
Amazing? Let's just say nothing else can do this and say
Sony at the same time.

HiFD

DO WHAT YOU WANT TO DO.™

www.sony-hifd.com

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# Pentium II

## Katmai Cometh

**Intel's new 500MHz screamer is expressly designed to accelerate your most exciting games and applications. Our benchmarks tell a story of power unleashed—just make sure you're running optimized code.**

by Jon Phillips

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**After months of speculation, The Chip Formerly Known as Katmai has arrived. Herewith, we delineate everything you need to know about Intel's fastest, most complex processor to date.**

**What's the difference between a Pentium II and Pentium III?** The two CPUs employ the exact same core P6 architecture. However, the P-III—code-named Katmai—includes eight new registers that support 70 new multimedia instructions. The new instructions—code-named Katmai New Instructions, now called Streaming SIMD Extensions, or SSE—supercharge performance in 3D games as well as productivity apps such as image editors, video encoders, and speech-recognition software.

Physically, the P-III die and its attendant 512K of L2 cache now come in a Single Edge Contact Cartridge 2 (SECC2). Half of the cartridge's shell has been sheared off to attach a heatsink directly to the CPU die. This new design improves cooling efficiency.

**Streaming SIMD? Come again?** SIMD stands for Single Instruction Multiple Data. This processing strategy tells a single program instruction to perform the same operation on two or more pieces of data; in effect, you get multiple calculations for the price of one. SIMD floating-point operations are extremely useful for setting up polygons, lighting effects, and physics models in 3D games (your 3D accelerator card handles actual pixel rendering). The 70-member SSE instruction family also includes SIMD integer enhancements, which pick up where the old MMX multimedia instructions left off. A third branch of the SSE family comprises memory streaming instructions, which help a program push data through the CPU's cache more efficiently.

Different applications use different parts of SSE in different ways. While a 3D game may only use SIMD floating-point instructions, video-encoding software may use SIMD integer instructions on top of memory-streaming. It all depends on the nature of the application in question, and the savvy of the programmer who developed it. A good developer will look at the full SSE instruction set and use as many SIMD shortcuts as possible to execute calculations in double-time. We expect game developers to parlay SSE dividends into more complex modeling, lighting, and collision detection. In short, SSE allows developers to make richer games without suffering a performance hit.

For the full story on SIMD—and why SSE doesn't reach its full potential—see our Katmai preview in the February 1999 issue.

**How can I realize the benefits of SSE?** First, you'll need an SSE-optimized processor. Right now, this means running a P-III. Second, you'll need support software that's been optimized for SSE compatibility. This means installing DirectX 6.1 and new videocard drivers. Third, you'll need SSE-optimized patches for your existing games and applications, or completely new software versions that have been optimized for SSE from the ground up.

Intel says you should see some performance improvements in *non*optimized games running under DirectX 6.1 and SSE-optimized videocard drivers; our early testing suggests such improvements are negligible at best. We found that amazing performance boosts are dependent on running SSE-optimized game and application code.

**Besides SSE, does the P-III bring anything else to the table?** Yes. First, the P-III will launch at 450MHz and 500MHz; the P-II family tops out at 450MHz. Second, the P-III has a new security feature called CPU Number, a unique, 64-bit serial number burned into the CPU's circuitry. This can help network bosses compare a chip's serial number to a database of assigned numbers and clock speeds. It can also reveal whether a 450MHz CPU has been overclocked and re-marked to 500MHz. Acknowledging the Big Brother overtones of CPU Number, Intel will distribute software that turns it on and off. The number will still be present, but no one will be able to read it.

**Overclocked P-IIIs? Hasn't Intel blocked overclocking forever?** Maybe, maybe not. See our news story on page 26.

**How do I upgrade to P-III?** Flash your 440BX motherboard's BIOS with an SSE-optimized update, then plug in your new P-III. Now install SSE-ready videocard drivers, then DirectX 6.1.

You'll also need to be running a P-III-compatible operating system: The CPU's new registers begat a new processor mode that allows the CPU to execute SIMD floating-point calculations simultaneously with "regular" floating-point calculations and MMX calculations. And any new processor mode requires OS compatibility. Win98/2000 is fully compatible. NT4 Service Pack 4+ requires a patch for full compatibility. Win3.1/95 and NT4 Service Pack 3 will run on a P-III, but cannot take advantage of SIMD floating-point. The only version of Linux that's fully compatible is 2.3.

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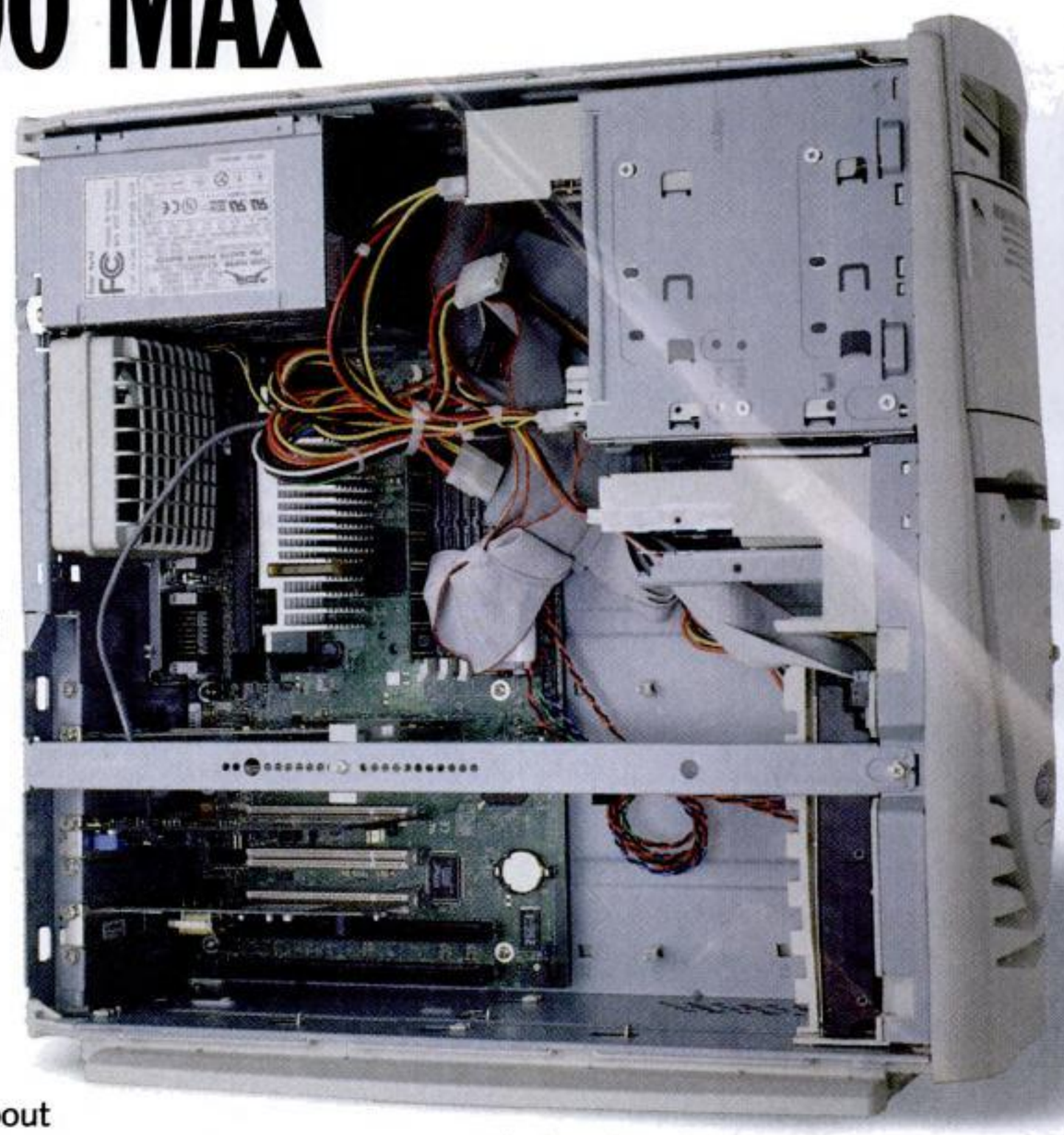
# Micron Millennia 500 MAX

## Power-heavy, feature-light



Stuffed with essentially the same power parts as the other two machines in this roundup, the Millennia 500 performed excellently during benchmarking, but couldn't emerge as an obvious winner.

Each box contains a 500MHz Pentium III, 128MB of SDRAM, an IBM DeskStar hard drive, and a 16MB nVidia TNT videocard. Since these particular components play pivotal roles in most of our performance tests, benchmark scores were almost indistinguishable from one machine to the next. For example, the Millennia scored 113fps in our Direct3D test, while the Dell machine took third place in this benchmark, but was only three frames off. The Micron also paced the Dell in hard drive and 3D rendering performance.

The Millennia did force the pace, however, in business and design apps. The SYSmark score of 204 is a full 23 points better than the Dell and the Compaq. We were also thrilled to see the Millennia set a bootLab record by breaking a minute in our *Photoshop* test, besting the other two machines by about five seconds.

But five seconds really don't matter when you're dealing with so much P-III power to start with. The tourney thus becomes a battle of features.

Let's start with the soundcard. With the Millennia 500, Micron is introducing a "value" version of Creative Lab's Sound Blaster Live!. This card is nearly identical to the regular version—giving you a pro-level sound DSP and 3D positional sound effects via two stereo outs—but lacks all its digital connections.

Sonogistix's three-piece Monsoon speaker system complements the Live! with movie-house intensity that's loud but limited to two discrete channels. The subwoofer pumps bass aplenty, but the satellites suffer distortion when bass frequencies creep over at high volumes. Still, we love the Monsoon's post-apocalyptic industrial styling.

Pioneer's latest DVD-ROM drive is complemented by Quadrant's SoftDVD player, saving you a PCI slot and the price of a hardware decoder. The hard versus soft decoding debate can rage forever, but the fact remains that unless you're sitting less than a foot away from your monitor, you won't see any of Quadrant's negligible artifacting.

Yep, the Millennia is configured for power, but lacks TV-out and newfangled amenities such as surround-sound speakers, IEEE 1394, broadband readiness, and a home networking strategy.

### PLUSES

- Pentium III
- Sound Blaster Live!
- 22GB hard drive
- Screaming benchmarks
- Two open PCI slots

### MINUSES

- No TV-out
- No surround-sound speakers
- No networking card
- No broadband modem

### UNDER THE HOOD

| THE BRAINS | |
|---|---|
| CPU | Pentium III 500MHz |
| L2 Cache | 512K closely coupled, half core CPU speed |
| RAM | 128MB 100MHz SDRAM (384MB max) |
| Motherboard | Intel Seattle II; 440BX chipset, ATX formfactor |
| Drive Bays | Four 5.25-inch (two free); one 3.5 inch |
| I/O Ports | Two USB, one parallel, two serial, one gameport |
| **DISPLAY** | |
| Video | 16MB Diamond Viper V550 AGP (nVidia TNT chipset) |
| Monitor | Micron 900 LX (18-inch viewable, .26mm dot pitch) |
| Res/Refresh | 1600x1280/71Hz |
| **STORAGE** | |
| Hard Drive | 22GB IBM DeskStar, 7200RPM (ATA-66, but runs on an ATA-33 controller) |
| CD/DVD | Pioneer DVD-103 (rated 6x DVD/32x CD-ROM) |
| Removable | Iomega Zip |
| Fax/Modem | 3Com Coyote (33.6K send/56K for X2 and V.90 receiving) |
| **SOUND** | |
| Sound | Creative Labs Sound Blaster Live! Value edition |
| Speakers | Sonogistix Monsoon MM1000 three-piece |
| **OTHER** | |
| Microsoft IntelliMouse I Micron keyboard, 200-watt power supply | |
| **THE BUNDLE** | |
| Windows 98 I Microsoft Office 97 Small Business Edition I Norton Anti-Virus | |

BOOT 0:49 DOWN 0:04

### REAL WORLD BENCHMARKING

| | |
|---|---|
| CPU/MOTHERBOARD bootMark | 239.6 |
| WINDOWS APPS SYSmark 98 official score | 204 |
| HARD DRIVE HD Tach MB/sec | 16.8 |
| CD-ROM CD Tach98 drive rating | 21.5x |
| 3D RENDERING Newtek Inspire3D sec | 437 |
| DESKTOP PUBLISHING Adobe Photoshop 5.0 sec | 59 |
| DIRECT3D ForsakenMark fps | 113 |
| OPENGL Quake2 v3.15 fps | 60.5 |

### MAXIMUM PC VERDICT

**Price** $2,899 with 19-inch monitor, $2,505 without
**Company** Micron
**Phone** 888.228.9634
**URL** www.micronpc.com

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**The Millennia doesn't stumble in a single benchmark category, but Micron has lost the edge in features to other manufacturers.**



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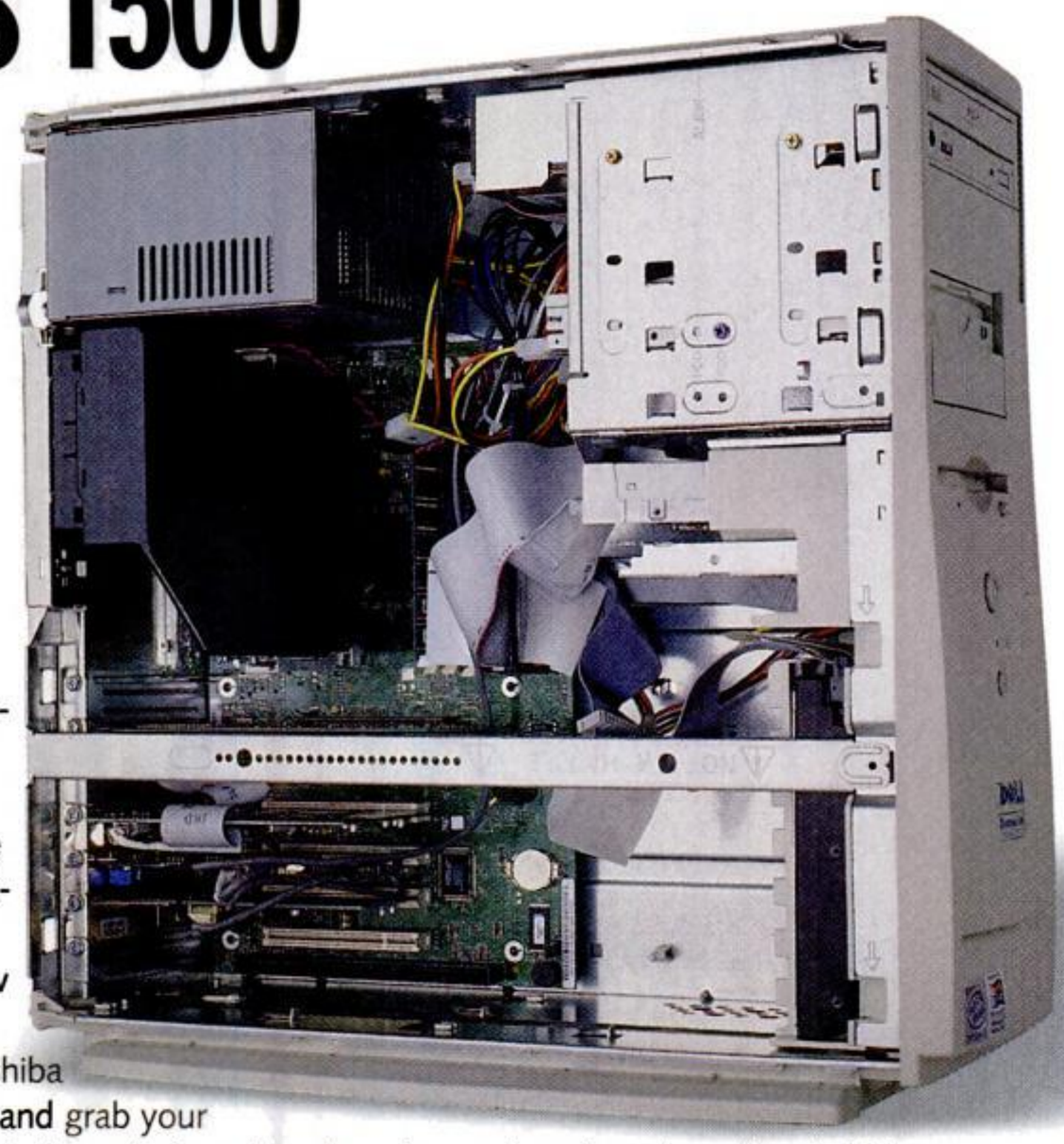
# Dell Dimension XPS T500

## Punchy performance, awesome sound



MAXIMUM PC KICK-ASS! product

Sure, we could rave ad infinitum about the Dimension's CPU, hard drive, and OpenGL gaming performance. In each of these areas, the Dimension took first place, edging the Micron Millennia a smidgen here and there. And in general, the Dimension benched with all the oomph you'd expect from Dell's high-performance line, stumbling only in the CD-ROM benchmark with a creepy-low 13.2x.

**PLUSES**
- Pentium III
- 22GB hard drive
- Two open PCI slots
- Surround-sound speakers
- TV-Out
- Screaming benchmarks

**MINUSES**
- Poor CD-ROM performance
- Soundcard doesn't support four channels

Sure, we could focus on the Dimension's power, but what really turned us on was its spectacular DVD strategy, which includes everything you need for a kick-ass home theater experience. It all begins with the five-piece Altec Lansing Dolby Digital surround-sound speaker system. Position two satellites behind you and two in front of you, place the sub-woofer in the middle, then connect the whole mess to the sound-card and DVD decoder card. Now plop an action movie into the Toshiba DVD-ROM drive, and grab your seat as all hell breaks loose in four discrete channels.

Unlike the Millennia, the Dimension ships with a TV-out connector. This means you can pipe the DVD video signal to your TV set, enabling the final piece in your home theater puzzle. The Quadrant decoding is hardly the cleanest we've seen, but is still prettier than a piece of hair stuck on a projector lens. And the card does enable the AC-3 surround sound that thumps so well on the Altec Lansings. Sadly, the Montego II soundcard is a dumbed-down OEM version that doesn't include dual outs, which means you can't listen to the four-way discrete audio granted by the card's chipset.

An STB TNT videocard and 3Com PCI modem round out the PCI slot scenario, leaving you with two open slots (exercising the cable modem or DSL options would consume another slot). Above the slots sits the Pentium III in all its shrouded Darth Vader badness. Dell positioned the CPU in the middle of the black plastic wind tunnel for focused cooling. A north wind blows downward into the tunnel, while a side fan sucks heated air out toward the west. Despite its one benchmarking blunder, the Dimension gets a kick-ass award for stout power and great features in all the right places. Just avoid the flat-panel monitor option: the 1500FP suffers bad pixel noise problems and doesn't have an auto-adjust button to get the best picture possible with a single touch.

### UNDER THE HOOD

| | |
|---|---|
| **THE BRAINS** | |
| CPU | Pentium III 500MHz |
| L2 Cache | 512K closely coupled, half core CPU speed |
| RAM | 128MB 100MHz SDRAM (768MB max) |
| Motherboard | Intel Seattle II; 440BX chipset, ATX formfactor |
| Drive Bays | Four 5.25-inch (two open), one 3.5-inch |
| I/O Ports | Two USB, one serial, one parallel, game port, composite video-out, S-video out, S/PDIF |
| **DISPLAY** | |
| Video | 16MB STB nVidia TNT, Quadrant CineMaster C-1.2D DVD decoder card |
| Monitor | 15-inch viewable 1500FP flat-panel LCD |
| Resolution | 1024x768 |
| **STORAGE** | |
| Hard Drive | 22GB IBM DeskStar, 7,200RPM, Ultra ATA |
| CD/DVD | Toshiba SD-M1202 4.8x DVD-ROM |
| Removable | Iomega Zip |
| Fax/Modem | 3Com V.90 PCI Telephony WinModem |
| **SOUND** | |
| Sound | Turtle Beach Montego II |
| Speakers | Altec Lansing ADA880 Dolby Digital five-speaker system |
| **OTHER** | |
| Microsoft IntelliMouse | |
| **THE BUNDLE** | |
| Windows 98 \| Microsoft Office 97 Small Business Edition \| Bookshelf 98 | |

BOOT 1:01 DOWN 0:02

### REAL WORLD BENCHMARKING

| | | |
|---|---|---|
| CPU/MOTHERBOARD bootMark | | 241.6 |
| WINDOWS APPS SYSmark 98 | official score | 181 |
| HARD DRIVE HD Tach | MB/sec | 16.7 |
| CD-ROM CD Tach98 | drive rating | 13.2x |
| 3D RENDERING Newtek Inspire3D | sec | 437 |
| DESKTOP PUBLISHING Adobe Photoshop 5.0 | sec | 65 |
| DIRECT3D ForsakenMark | fps | 110.0 |
| OPENGL Quake2 v3.15 | fps | 62.7 |

### MAXIMUM PC VERDICT

**Price** $3,479 with 15-inch flat-panel, $2,599 without
**Company** Dell
**Phone** 800.388.8542
**URL** www.dell.com

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**The T500 has everything you need for a hardcore entertainment experience.**



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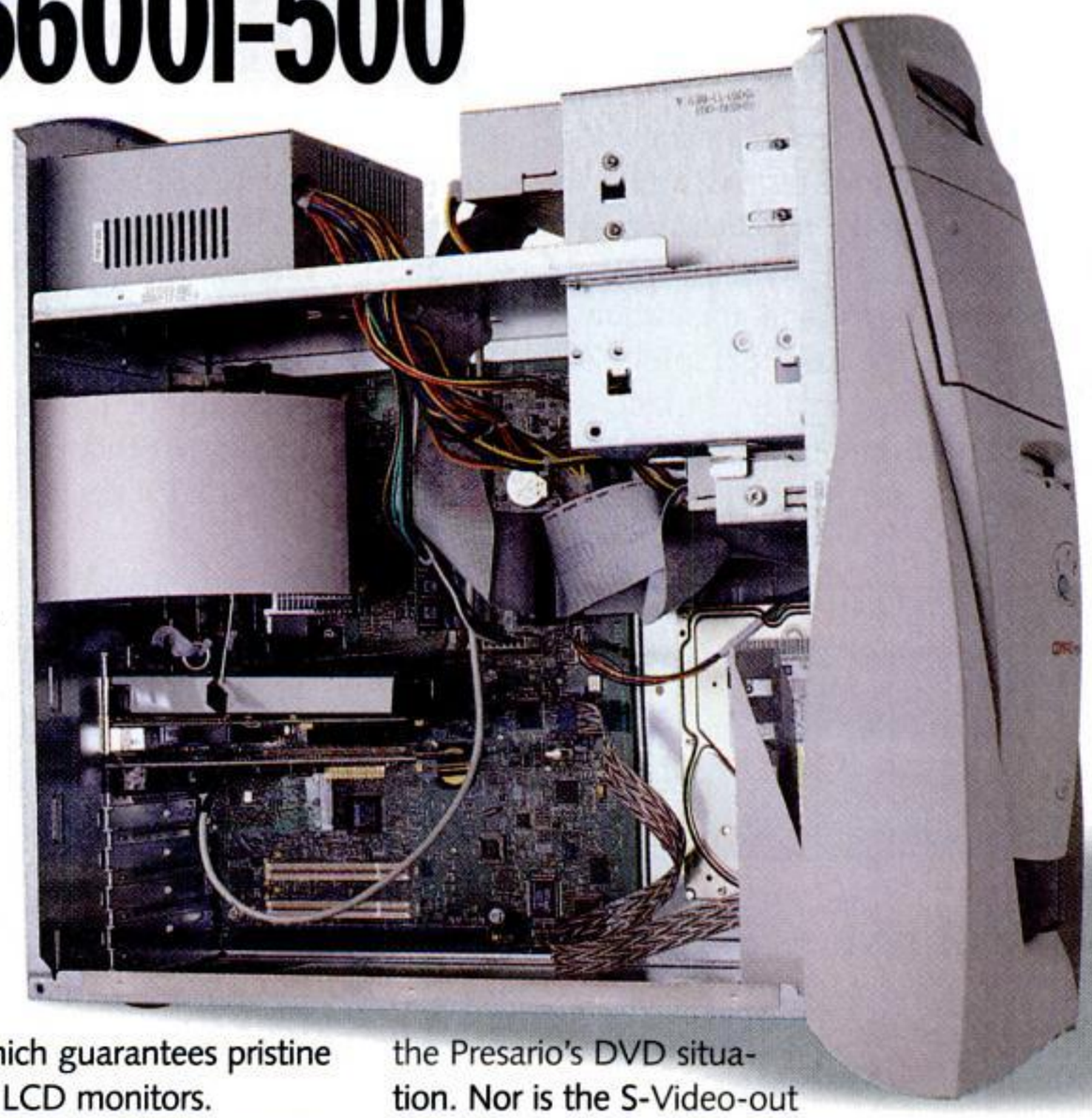
# Compaq Presario 5600i-500

## Primed for 2000



**PLUSES**

- Pentium III
- IEEE 1394, Ethernet, phone-line networking, G.Lite, and Digital Flat Panel interfaces
- S-Video out
- Two open PCI slots

**MINUSES**

- Ugly DVD playback
- Unusually slow hard drive performance
- logy performance in general

Of all the Pentium III machines sitting in our test lab, the Presario includes the most features that anticipate the future of computing. Our tour of Tomorrowland begins on the top of the rear panel. We first hit a port for IEEE 1394, a 400Mbps I/O interface poised to become de rigueur for digital video equipment. Moving downward, we happen upon a traditional 10/100 Ethernet port, and then the port for Compaq's 1Mbps phone-line networking solution. Based on Tut System's HomeRun technology, this feature lets you network your Presario via your home's existing phone wires.

We next encounter the jacks for the 1.5Max Digital Modem, which grants not only 56Kbps V.90 support, but also support for G.Lite, an emerging DSL standard that provides 1.5Mbps throughput over plain-old telephone lines. Our tour of the rear panel ends with the Digital Flat Panel interface, which guarantees pristine performance from LCD monitors.

For the sake of convenience, Compaq even threw in two USB ports and another IEEE 1394 port on the *front* of the Presario. All together, these features make a compelling argument for a kick-ass award. But unfortunately, the Presario is plagued by nagging problems.

First off, it lagged behind the other machines during benchmarking. Out of eight benchmark categories, it placed last in five tests. It was six points off the pace in our CPU test, and lagged by an alarming 5MB/sec in the hard drive test—despite the fact that it was using the exact same hard drive as the other machines.

Second, the Presario boasts the ugliest DVD decoding we've ever seen. In one fell swoop, the machine's atrocious artifacting (care of Mediamatics software) destroys the argument for software-based decoding and all its attendant benefits. For another $175, Compaq offers an upgrade to a six-piece, 160 watt JBL speaker system that would complement DVD visuals with ambient surround sound—but even this isn't enough to save the Presario's DVD situation. Nor is the S-Video-out jack. Why would anyone want to pipe this decoding to a larger screen?

The Presario includes connectivity features that are months ahead of the competition, but lags on benchmarks and falls apart completely in hard drive performance and DVD visual quality. This is a great machine if you want to jump headlong into some promising new technologies, but can't compete as the ultimate power station or entertainment box.

### UNDER THE HOOD

| | |
|---|---|
| **THE BRAINS** | |
| CPU | Pentium III 500MHz |
| L2 Cache | 512K closely coupled, half core processor speed |
| RAM | 128 MB SDRAM (384MB max) |
| Motherboard | Compaq ATX with 440BX core-logic chipset |
| Drive Bays | Four 5.25-inch (two open), one 3.5-inch |
| I/O Ports | Four USB, two IEEE 1394, one parallel, one serial, S-video out, RJ-45 10/100 Ethernet |
| **DISPLAY** | |
| Video | 16MB Diamond Viper 500 (nVidia TNT; includes Digital Flat Panel interface) |
| Monitor | Presario MV 900, 17.9-inch viewable, 0.26mm dot pitch |
| Res/Refresh | 1600x1200/75Hz |
| **STORAGE** | |
| Hard Drive | 14.4GB IBM DeskStar Ultra ATA, 7,200RPM |
| CD/DVD | Compaq 6x DVD SR8583 (drive multisourced from various vendors) |
| Removable | Iomega Zip |
| Fax/Modem | 1.5Max Digital Modem (supports both 56K V.90 and 1.5Mbps G.Lite ADSL) |
| **SOUND** | |
| Sound | Diamond Monster MX 300 |
| Speakers | JBL satellites (mounted on monitor) |
| **OTHER** | |
| 1Mbps Phoneline Home Networking (Tut HomeRun technology) I Internet keyboard I Compaq scroll mouse | |
| **THE BUNDLE** | |
| Windows 98 I Works 4.5 I Word 97 I Money 99 I Encarta Encyclopedia 99 I Intel Video Phone 3.0 I Asymetrix Digital Video Producer I Quicken Basic 99 I Incoming AGP I LivePix Deluxe 2.0 | |

BOOT 1:29 DOWN 0:05

### REAL WORLD BENCHMARKING

| | | |
|---|---|---|
| CPU/MOTHERBOARD bootMark | | 235 |
| WINDOWS APPS SYSmark 98 | official score | 181 |
| HARD DRIVE HD Tach | MB/sec | 11.8 |
| CD-ROM CD Tach98 | drive rating | 21.5x |
| 3D RENDERING Newtek Inspire3D | sec | 439 |
| DESKTOP PUBLISHING Adobe Photoshop 5.0 | sec | 66 |
| DIRECT3D ForsakenMark | fps | 111.0 + |
| OPENGL Quake2 v3.15 | fps | 58.0 |

### MAXIMUM PC VERDICT

**Price** $3,000 with 19-inch monitor, $2,400 without
**Company** Compaq
**Phone** 800.345.1518
**URL** www.compaq.com

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**This Presario represents the future of computing. Too bad its performance couldn't close the deal.**



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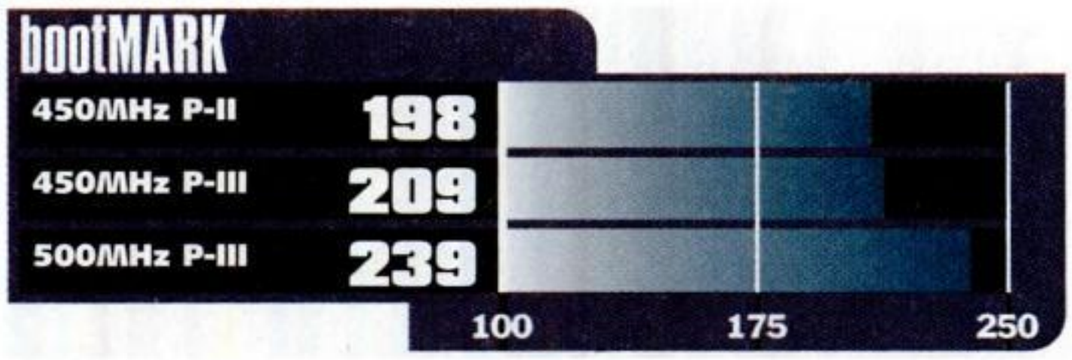
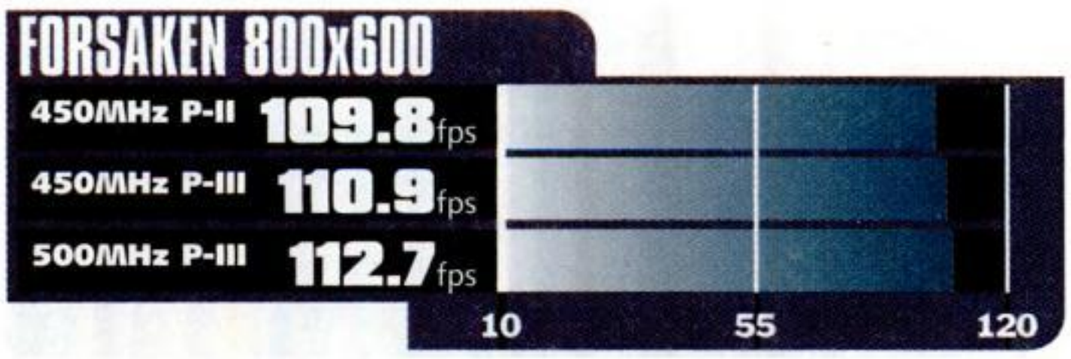
# Benchmarks: Where You'll Find Performance

We conducted a Benchmark-o-Rama of performance tests to determine exactly where you'll find Pentium III optimization benefits. The short story: You'll need optimized game and application code to realize the best that Intel's 70 new instructions have to offer. In fact, we found almost no tangible framerate improvements in nonoptimized game code running under SSE-optimized videocard drivers and DirectX 6.1. (It should be noted that only beta versions of the videocard drivers and DX6.1 were available during testing.)

Our benchmarking strategy was simple: To isolate the power of SSE, we compared the performance of a 450MHz P-II to a 450MHz P-III by testing each CPU in exactly the same control system. The two processors are virtually identical, save the Pentium III's new registers and SSE instructions. We also benchmarked a 500MHz P-III to illustrate the full potential of Intel power. Please note that we did not test how well the processors ran *Quake II*: At press time, nVidia had not yet released any SSE-optimized OpenGL drivers.

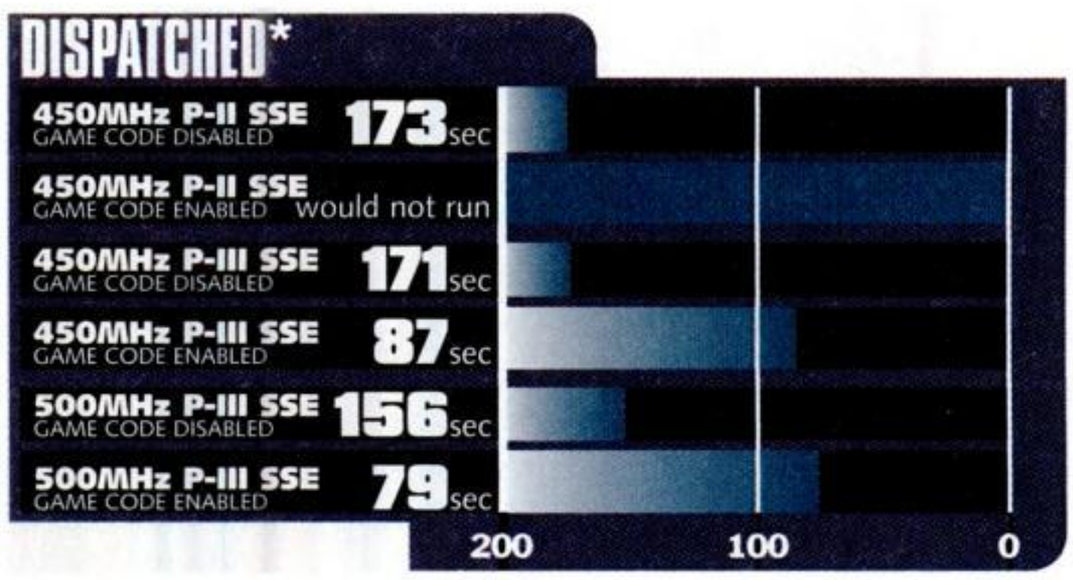



**THE TEST** Our essential CPU benchmark isolates raw processor power, along with the strength of the motherboard's core-logic chipset. This test in no way leverages SSE optimizations. **ANALYSIS** The P-II and P-III are fabled to possess the same core P6 processor architecture, yet the P-III emerges more powerful. While a bit mystified by this particular benchmark result, Intel thinks the power boost might be ascribed to a more efficient manufacturing process (during the lifecycle of any given CPU architecture, the manufacturer will often shrink and simplify circuit layouts for efficiency).

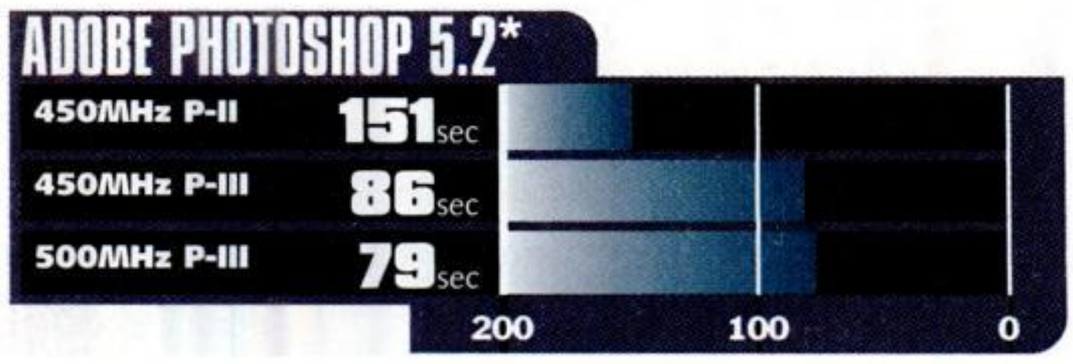



**THE TEST** This Direct3D benchmark (which we use for all system reviews) should isolate the benefits offered by SSE-optimized videocard drivers and SSE-optimized DirectX 6.1 on *non*-SSE-optimized DX5 game code. **ANALYSIS** SSE driver and DirectX optimizations alone appear to make almost no difference whatsoever. Three things may be going on here: 1) the benchmark doesn't boast high-poly-count models and lighting effects intense enough to benefit from SSE optimizations; 2) the videocard is bottlenecking the CPU; 3) simple driver and DirectX optimizations just don't do jack.

**THE TEST** This Direct3D benchmark should isolate the benefits offered by SSE-optimized videocard drivers and DirectX 6.1 on *non*-SSE-optimized DX6 game code. *Turok 2* throws more intense models and lighting effects on the CPU than does *Forsaken*. **ANALYSIS** Driver and DirectX optimizations aren't enough to make a difference—and unlike *Forsaken*, *Turok 2* is DX6 game.




**THE TEST** This benchmark is based on a Direct3D game being developed by Rage Software. It is coded with SSE floating-point and memory streaming optimizations, which can be toggled on and off. The game itself is riddled with high-poly-count models and environments that include up to 110 light sources, so the benchmark can definitely use all the floating-point power a CPU might throw at it. During testing, we timed how long it took to complete the benchmark's key underground racing sequence (a final average framerate count was unavailable). **ANALYSIS** Games that genuinely require immense floating-point power can greatly benefit from in-game SSE coding. Toggling SSE code on and off revealed performance differentials of almost 100%.




**THE TEST** This benchmark—not be confused with our regular *Photoshop* test that appears in system reviews—is a timed action script that applies resizings, CMYK color conversions, and sharpen/unsharpen, wind, watermark, and MMX lighting filters to two large image files. The test isolates the benefits of writing application code to directly leverage SIMD floating-point and memory streaming instructions. (This *Photoshop* version has been patched to take advantage of SSE.) **ANALYSIS** Screw games. If all you do is run *Photoshop*, the Pentium III might be a requisite slot-stuffer. It must be noted, however, that this action script employs the very activities and filters that can most benefit from SSE optimizations (the MMX lighting filter, for example, has new SSE enhancements).



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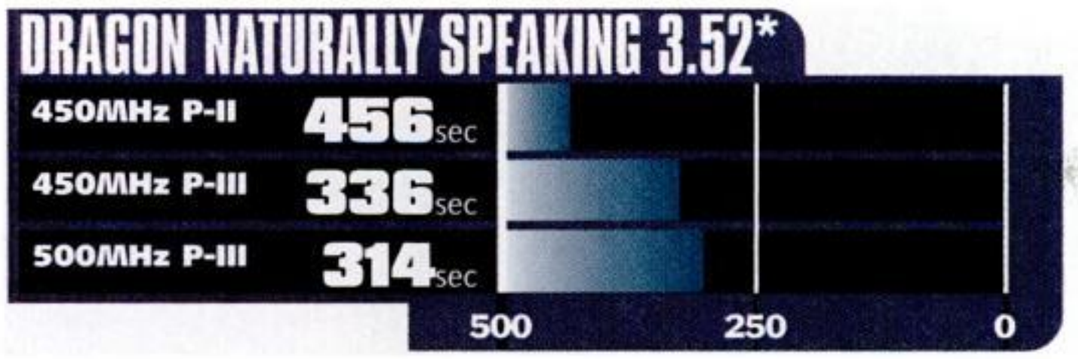
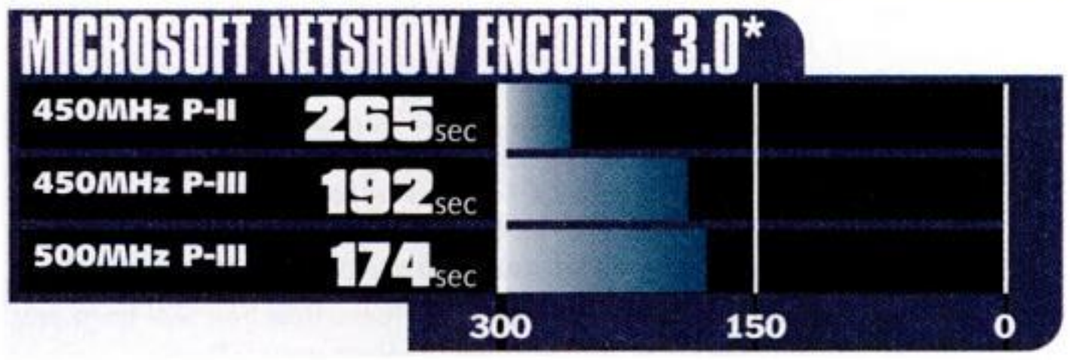



**THE TEST** This benchmark times how long it takes to translate an 8MB WAV file of spoken speech into written text via Dragon's SSE-optimized speech recognition software—once again isolating the benefits of optimized application code. Intel says speech recognition is the next "killer app," and will be legitimized by Pentium III processing power. We believe this test is very SIMD- and memory-streaming-intensive. **ANALYSIS** While the results weren't quite as dramatic as the *Photoshop* test, we found that with SSE optimizations, speech-recognition software no longer appears to be a great big sham.




**THE TEST** This benchmark times how long it takes to convert a 203MB AVI file into Microsoft's Advanced Streaming Format via Microsoft's SSE-optimized video encoding software. This optimized application code leverages SSE memory streaming as well as Intel's new video instruction, which is an extension of the MMX integer instruction set. **ANALYSIS** Once again, SSE proves its awesome benefits—this time with instructions that have nothing to do with SIMD floating-point.

# The Upshot

Pentium III SSE optimizations are breathtaking, but early benchmarking says they only really show their pretty tail feathers in enhanced game and application code. We therefore have to trust software developers to release P-III patches for existing titles and code works-in-progress to take advantage of the new instructions.

* This benchmark was supplied to us by Intel. Because it runs on application code written by an independent software developer, we're confident that it's an honest metric of the Pentium III's strength. We acknowledge, however, that the benchmark's specific action script may be designed to take as much advantage of SSE as possible. Why even run Intel-supplied benchmarks, you ask? Because at press time, no SSE-optimized application code was publicly available. Keep reading *Maximum PC* for continuing SSE performance coverage.

**CONTROL SYSTEM 440BX Seattle II motherboard with SSE-optimized BIOS, 256MB 100MHz SDRAM, 16MB Diamond V550 videocard (using beta SSE-optimized nVidia TNT reference drivers), IBM DeskStar 22 hard drive (ATA-33, 7,200RPM).**



**What lies in the P-III's future?** In its current 0.25-micron fab process, we expect the P-III to make only one bin jump, going up to 533MHz. This will happen this summer when Intel releases its new Intel 820 core-logic chipset, which supercedes the 440BX. The 820 will offer support for RDRAM memory, AGP 4x, ATA-66, and a 133MHz system bus (133MHz times a 4.0 multiplier equals 533MHz). Keep reading *Maximum PC* for information on Intel's jump to a 0.18-micron process.

**When will SSE reach Intel's entire line-up?** SSE-laced Xeons (code-named Tanner) should launch at 500MHz sometime in March. Intel says SSE won't hit Celeron-level CPUs until 2000.

**THE SPECS**

| |
|---|
| **Processor** Pentium III |
| **Type** P6 core with eight new registers and 70 new multimedia instructions |
| **Interface** Single Edge Contact Cartridge 2/Slot 1 |
| **Die Size** 9.5 million transistors, 12.3mm x 10.4mm |
| **Core Voltage** 2 volts |
| **Fab size** 0.25-micron (at launch) |
| **Core frequency speeds** 450/500MHz (at launch) |
| **L2 Cache** 512K running at half core CPU frequency |
| **Compatible core-logic chipsets** 440BX (at launch) |
| **Price Per 1,000 Units** To be announced on our web site |

**What about SSE support?** All the major video chipset manufacturers have pledged full driver support to coincide with the P-III's late-February launch. At press time, however, only nVidia had actual drivers to play with, and even these were beta and didn't include SSE optimizations for OpenGL.

Intel says the SSE launch will be much more successful than the MMX launch, and by June, more than 200 optimized games and applications will be available. Game companies currently working on SSE titles include: 3D Realms, Acclaim, Activision, Adrenaline, Cavedog, Cendant, Core Design, Electronic Arts, Eidos, GT Interactive, Gathering of Developers, id, Interplay, Kalisto, Looking Glass, Lucas Arts, Metropolis, Microsoft, Presto, Psygnosis, Rage, Sega, Shiny, and Ubisoft.

**How does the P-III compare to AMD's K6-2?** Because the two processors are based on substantially different core architectures and interact with memory and cache differently, it's difficult to compare them. But we will comment on instruction extensions: Intel's 70 SSE instructions currently offer the same SIMD floating-point power as the K6-2's 21 3DNow! instructions, but bring more to the table via memory streaming and MMX extensions. Intel's SIMD floating-point power is currently bound by the P-III's core architecture and could double when Intel makes a leap past the P6 architecture legacy. AMD's 3DNow! SIMD floating-point power cannot make such a leap.

**Bottom line: Should everyone buy a new P-III?** Everyone has different computing needs that must be balanced against budget constraints—and the P-III is an expensive part. But with that caveat stated: If you're an early adopter and confident all your favorite software will be coded directly for SSE, you should buy a P-III for the fastest desktop computing experience on the planet. If you're a bit more gun-shy, wait a few months for the software support question to be resolved, and then buy a 533MHz P-III system based on a 133MHz system bus and AGP 4x.



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# Ask the Doctor

**This month THE DOCTOR looks at:**

- **Motherboard memory caching**
- **Automated dial-up difficulties**
- **DVD copy protection**
- **The Pentium II pin 21 trick**

**and more...**

# Symptom | Diagnosis | Cure

Even the burliest of PCs comes down with a bug every now and then. That's when you need to call The Doctor and get a diagnosis that'll have you up and running in no time. Send your symptoms to: **doctor@maximumpc.com**

## TX is the Place to Be

Since my TX motherboard can't cache more than 64MB, I pulled one of the 64MB DIMMs. My score on the bootMark immediately jumped from 59 to 81. Now *Quake* (and especially *GLQuake*) hits my hard drive twice as hard, slowing gameplay to a crawl. Before, when I was running 128MB, my hard drive would hardly see a hit. Should I put the other 64MB back in, or use it for a bookmark?

*—John Chappel*

That depends on what you do with your computer. Do you spend a lot of time benchmarking core system components, or do you play games, retrieve e-mail, edit sound files, or retouch photos? If you lean more toward the latter, I recommend putting the 64MB back in. The additional memory greatly increases performance on memory-intensive programs such as *Photoshop* and *Quake*. A full 128MB is especially handy with Windows.

It's a Catch-22 with older chipsets. Intel aimed the 430TX at the home user, and thus didn't put in all those power-user features such as more than 64MB of cachable system RAM or multiprocessor support. These features were left to other Intel core-logic PCIsets such as the 430HX.

If you want to know what's best for your PC, figure out which apps you use most and gauge how much memory you need for them. Don't base your decisions solely on one benchmark.

**"If you want to know what's best for your PC, figure out which apps you use the most and gauge how much memory you need for them. Don't base your decisions solely on one benchmark."**

## RealAnnoying

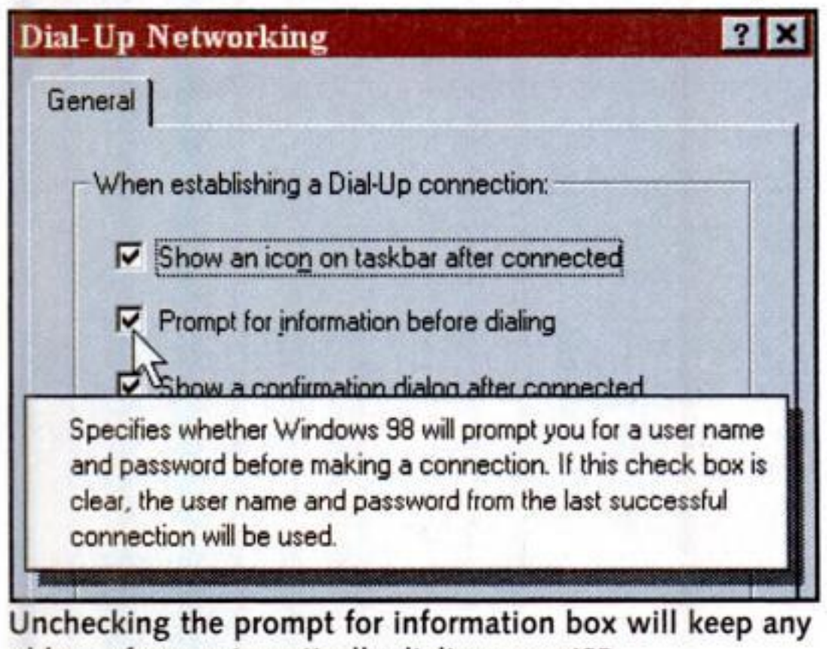
I recently upgraded *RealPlayer* to G2 beta2 version, and now every time Windows 98 loads, dial-up networking tries to connect to my ISP, whether I enter a password or not.

If I let it go and connect, no program starts up, and no information is being uploaded or downloaded. I've unchecked the automatic dial-up box to stop this (but of course the box still pops up).

I've disabled *RealPlayer*, tried uninstalling *RealPlayer*, looked for changes to my dial-up connection, and looked in WIN.INI and the Registry (although I'm not sure what I'm looking for), all to no avail.

*—Terry Pallot*

It sounds like you installed *RealPlayer* with the SmartStart feature enabled. As Windows starts up, SmartStart loads itself into the system tray and attempts to dial-up your ISP to automatically update *RealPlayer* headlines. I believe the reason you're not consulted is because you have Dial-up




**Unchecking the prompt for information box will keep any old app from automatically dialing your ISP.**

Networking set to automatically connect when a client needs net access. This means any app, such as your e-mail program or web browser, will automatically connect to your ISP as it launches—without prompting for a username and password.

You can turn off SmartStart in *RealPlayer* by unchecking the box in the SmartStart section in the General Preferences tab. If you don't want Windows to allow any client to automatically connect, make sure the "Prompt for information" box is checked under the Dial-Up Networking Connections Settings.

## BIOS Blunder

I bought a new Quantum Fireball 5.1GB and had no problems with it the first two weeks. But recently, I was messing around with the BIOS and changed the HD mode to Large. Now my drive won't register at all. Win98 won't detect the drive and it won't work in DOS. I changed all the settings in the BIOS back to Auto and nothing happens at all. Do I have to re-format my hard drive?

*—Darryl Fierling*

When you changed the IDE Mode Type setting to Large, it changed the rest of the drive settings, and since the drive doesn't support these settings, the BIOS doesn't recognize it. Other BIOS settings that may throw your hard drive into a tizzy are Normal, CHS, and LBA.

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.

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What perplexes me is why your BIOS didn't properly re-detect the drive when you set the hard drive type back to Auto. If your BIOS has an IDE device auto-detect feature, try using it to rediscover your hard drive and hardwire the proper settings into the Standard CMOS Setup section of the BIOS.

I'm worried that you may have hosed your data, since enabling or disabling LBA after the drive is partitioned has been known to make good data go bad. It all depends on what BIOS your motherboard uses.

You may also try re-jumpering your hard drive as a Master and putting it on your Secondary Bus. Make sure to set any CD-ROM drives or other drives there as a Slave.

## Big in Japan

I'm ready to buy a DVD drive, but I'm moving to Japan in six months. I've heard that all DVD units have a territorial lockout chip that prevents them from reading DVDs from other territories. I really can't afford to buy another DVD drive in Japan, and I may stay there for three years or more.

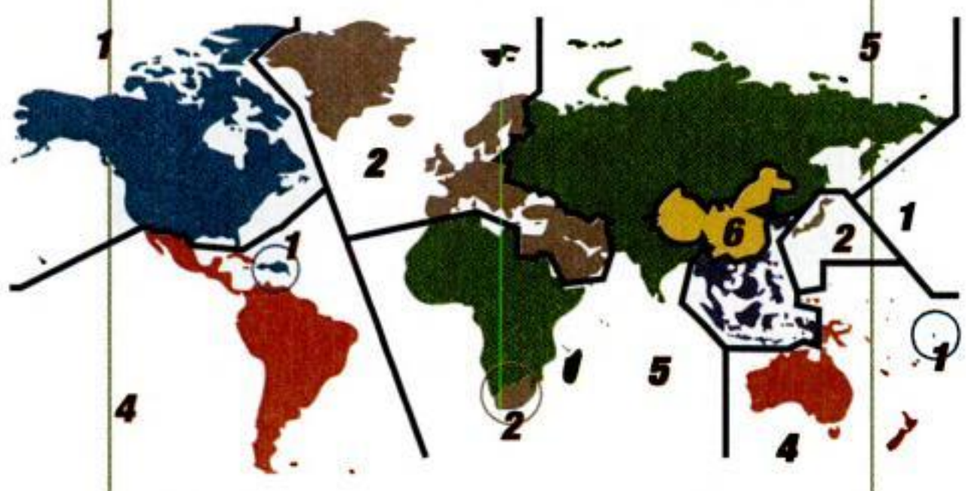
*—Nathan Edwards*

Great question! Actually, you'll run into more problems on the media than the player side. The Open DVD standard was formulated using the DVD Region Code that uses the Content Scramble System (CSS) copy-protection standard, which divides the world into six regions, and content designated for one region cannot be read by players in another. Along with copy protection, it gives the studios control over how movies are released in different areas of the world. DVD drives don't contain this coding, although MPEG-2 decoders do (both hardware and software).

Many MPEG-2 boards, such as Sigma Design's Hollywood+, let you change the DVD Region Code setting five times. After that, a "nominal handling charge" is required.

## Stand by Me

I've heard many things about the Windows suspend/standby feature and the power-management settings of some motherboards, but I don't really understand how they work together. I ask this because I have a sleep button on my case that doesn't work. I've tried to connect the cable from the button to the motherboard every way that I could think




**DVD discs are specially encoded to play back only on drives manufactured in one of six specific regions.**

of, but it just doesn't work. I have the latest BIOS version on my Intel SE440BX motherboard and the latest version of Windows 98.

Why doesn't Win98 have a suspend option listed in the Start or shutdown menus?

*—Andrew*

The suspend button on your case should plug directly into the two pins marked "sleep" on your motherboard. The button basically initiates Windows' standby mode. Is power management enabled in the BIOS, and does it show up in your Device Manager? Win98 will remove the standby option if power management loads incorrectly twice to keep you from losing data. If your machine has power management enabled in the BIOS and in Win98, but you have no standby option, remove the floppy drive controller from the Device Manager and reboot.

Keep in mind that while your machine may sleep, your fans may not. If they're jacked into the power supply, they probably won't spin down.

## AGP Checking Redux

In our February issue, I stated that there was no software that actually checked on your AGP status. I've since found a little program from Entech (**www.entechtaiwan.com**) called *PCIlist* that checks your AGP functionality. Go to Entech's web site and download it to check your slot.

# overclocker's CORNER

## 100MHz on the Cheap

I'm one of those cheapos referred to in the last issue who run a 266MHz Pentium II on a 66MHz system bus. I have a custom-built machine with an Abit 440BX and 100MHz SDRAM.

I've tried to change the setting to run the chip at 250MHz on a 100MHz FSB, but the board always resets to the default settings on boot. I heard you don't have to cover pin 21 on the P-II to run a 100MHz FSB with soft menu. Is this true?

*—Craig Mushens*

**"We do NOT recommend covering pin 21 on your Pentium II CPU unless you are really desperate, since masking it with tape will get the connector all gunky and nasty."**

Instead of trying 100MHz, try an 83MHz system-bus setting and a 4x multiplier if you have an older P-II 266MHz (0.35-micron). If you have a newer, Deschutes-type P-II 266MHz (0.25-micron), then you can try pushing that baby up to 100MHz x 4.

We do *not* recommend covering pin 21 on your Pentium II CPU unless you're really desperate, since masking it with tape will get the connector all gunky and nasty. We've heard about the much-vaunted pin-21 covering tweak that allows any Pentium II to run with a 100MHz-system bus and even tested it out in our labs, but all we got was a sticky SEC.

## Trickle Down Megahertz

I've been thinking of building a 300MHz K6-2 system using the ASUS P5A motherboard with a target bus speed of 100MHz. How does overclocking at a 100MHz bus speed affect AGP/PCI timing?

*—Scott James*

Both the PCI and AGP bus are dependent on the system-bus speed. Here's a little chart that shows you exactly how you will be affecting your bus when you scream past 100MHz with the ASUS P5A.

| SYSTEM BUS | AGP BUS | PCI BUS |
|---|---|---|
| 105MHz | 70MHz | 35MHz |
| 110MHz | 77.6MHz | 38.8MHz |
| 115MHz | 77.6MHz | 38.3MHz |
| 120MHz | 80MHz | 40MHz |

# IBM Microdrive

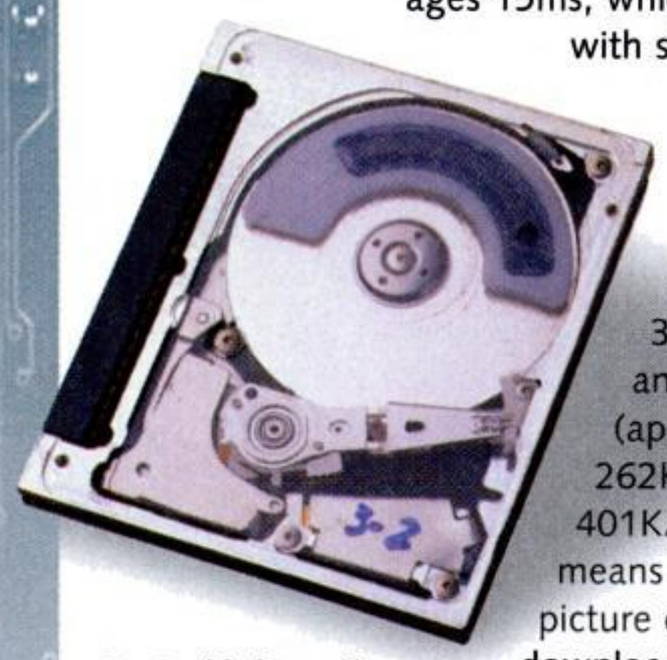
## The world's smallest hard disk drive

The Microdrive is a fully mechanical hard drive that is quite possibly one of the most amazing computer engineering feats yet (next to the microprocessor, of course). While other companies were pioneering new ways of making flash RAM capacities larger, sizes smaller, and prices more affordable, IBM was working on a coup: a hard drive that takes advantage of its Giant Magnetoresistive (GMR) head technology that incorporates larger areal capacities with microelectronic circuitry. What it has is a drive whose capacity far exceeds that of currently available flash RAM modules (the largest current capacity is 96MB). And with handheld PCs, digital cameras, and convergence technologies that combine them with video capture and other recording technologies, these drives have come in the nick of time.

**The IBM Microdrive (shown here and below at actual size) is a small hard drive wrapped in a case measuring approximately one inch square with a thickness of 3/16 of an inch!**

The Microdrive is built utilizing SanDisk's standard CompactFlash Type II (CF Type II) formfactor and interface. IBM also designed the drive to be rugged, knowing its small size would make it vulnerable. Low power consumption on par with existing 3.3-volt CompactFlash modules and performance were also a must.

Performance, while not as fast as flash RAM–based CompactFlash, is actually better than expected. Seek time for typical reads averages 15ms, which is on par with slower desktop IDE drives, and read/write transfer rates are between 32Mbps and 49Mbps (approximately 262K/sec to 401K/sec). This means a large picture could be downloaded in about 3 to 4 seconds. CompactFlash, by comparison, has a sustained read throughput of 1.2MB/sec and a sustained write throughput of 600K/sec using nonmechanical flash RAM.



**Big Daddy himself didn't believe the Microdrive was a fully functioning hard drive. This proves it.**

IBM also included some of its other leading-edge technologies, such as load/unload technology, Enhanced Adaptive Battery Life Extender 2.0, and TrueTrack Servo technology. The drive itself consists of a single platter and half a drive head. And believe it or not, the spindle spins at an amazing rate of 4,500RPM!

Pricing for the Microdrive was not determined at press time, although we've heard a rumored price of $1 per megabyte. CompactFlash, differentiated from typical RAM in that it's nonvolatile and retains memory without power, is currently priced at $3 to $4 per megabyte. Sounds like a lot, but flash RAM is not only faster, it's virtually shock-resistant.

SanDisk, a manufacturer of CompactFlash memory, believes its memory prices will fall as low as $1.50 per megabyte by the end of this year.

At press time, the following devices had announced Microdrive support: Canon's PowerShot Pro 70 digital camera, the HP Jornada, and Vadem Clio handheld PCs. IBM told us a video camera from Hitachi and an auto PC from Clarion are also on the release list. We'd love to see Microdrive support in the new Palm PDA and the next Diamond Rio MP3 player. Imagine, 340MB of MP3s...

*—Sean Cleveland*

**THE SPECS**

| | |
|---|---|
| **MEASUREMENTS** | 42.8x36.4x5.0 mm formfactor |
| | 17 grams |
| **POWER SUPPLY VOLTAGE** | 3.3 volts |
| **INTERFACE** | CompactFlash Type II |
| **CAPACITY** | 170/340MB |
| **DISCS** | 1 |
| **DATA HEADS** | 1/2 |
| **SPINDLE ROTATION SPEED** | 4,500RPM |

**PRODUCT AVAILABLE**

**Price** TBA
**Company** IBM Storage Division
**Phone** 888.426.5214
**URL** www.ibm.com

06.99


HARDWARE ON THE HORIZON AND SOFTWARE SOON TO SHIP

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# KryoTech Cool K6-2 500MHz

## So cool, you're hot

KryoTech has the ultimate AMD K6-2 experience tucked under the hood of its cool 500MHz box. But there are serious problems in this frigid paradise.

KryoTech sells these boxes bare-boned. For the $1,695 admission price, you get a 400MHz AMD K6-2 overclocked to 500MHz, FIC's PA-2013 Super 7 motherboard, and the much-vaunted KryoTech Cooling Case. This ATX mainboard was chosen due to its stability at high frequencies and inclusion of one AGP, three PCI, one ISA, and one shared PCI/ISA slot. Three DIMM sockets await 768MB of PC100 memory, while 1MB of L2 cache sits close to the Socket 7 interface.

The medium tower case, which contains three 3.5-inch and three 5-inch drive bays, is actually two units bolted together, with the cooling device sitting below the tower. One drive bay is dedicated to the front-mounted temperature display.

The heart of the cooling system—the compressor, condenser, and evaporator—comes in that lower block. Working on the concept of "phase-change refrigeration" (commonly used in home/commercial refrigeration systems), the system involves a closed-loop system that isolates and cools the CPU by lifting the heat away. This is accomplished by vaporizing continuously circulating refrigerant that's condensed back into a liquid. According to KryoTech, the phase change from liquid to gas creates an evaporative cooling effect, which pulls the offending heat off the CPU and into the refrigerant. The CPU is sandwiched between two cooling plates, and a big pipe connects the CPU to the coolant below. Unfortunately, all this cooling makes for one heavy package.

**Drum roll, please... the cooling system. Keen, ain't it?**

KryoTech is selling this current iteration, but plans to redesign the cooling system and add K6-3 to the mix. This will result in an even faster system and full NT compatibility.

Unfortunately, pimping out this current KryoTech with all the latest hi-tech goodies plunged us into hardware hell. Finding the right hardware combination that would work with the FIC motherboard proved a daunting task. We encountered problems galore trying to get the system up and running. nVidia's TNT board refused to run, and countless hardware combinations failed to yield a working system. This isn't KryoTech's problem—it's a Super 7 problem. The Super 7 initiative is filled with hardware problems, which KryoTech must address with its system moving forward. We also question the motherboard choice: the lack of a fifth PCI slot hurts power-user upgrades in the long run.

**It's big, bad, and cool. KryoTech's Cool K6-2 awaits your hardware... but can it handle anything you throw at it?**

KryoTech is aware of all these problems and plans on releasing its new design by the time you read this. It will also be cheaper.

While not worth investing in at this time, we'll reserve final judgement until we get the new Cool K6 unit in. Hopefully, KryoTech will have put this new K6-3 box through it paces.

*—Andrew Sanchez*

**PRODUCT AVAILABLE**

**Price** $1,695 (new-unit pricing TBA)
**Company** KryoTech
**Phone** 877.579.6832
**URL** www.kryotech.com

03.98

### KRYOTECH 500MHZ COOL K6-2 PC TESTED PERIPHERALS

Here's KryoTech's official listing of tested hardware.

**Operating System**
- Microsoft Windows 95
- Microsoft Windows 98

**SRAM (PC100)**
- TI
- Micron
- Fujitsu
- Samsung
- NEC

**CD-ROM Drives**
- Samsung CD Master 24E
- CyberDrive 24x
- Acer 24x

**Floppy Disk Drives**
- Panasonic JU-257A606P
- Mitsumi D359M3

**SCSI Adapters**
- Adaptec AHA 2940W/2940UW

**Hard Drives**
- Samsung VG33402A
- Seagate Barracuda ST34573W
- Seagate Cheetah ST3450W
- Seagate Medalist ST33221W
- Seagate Medalist 4321
- Western Digital Caviar 23200

**Video**
- Matrox Millennium II
- Diamond Stealth 3D 4000
- Diamond Viper 330
- Diamond Viper 550
- Diamond Monster 3D II (dual)
- Creative 3D Banshee

**Sound**:
- Diamond Monster Sound
- Creative Labs Sound Blaster AWE64

**NOTE:** This list is provided for informational purposes only. It does not constitute an endorsement or recommendation by KryoTech of one product over another. Other products may also function as well as or better than the products listed.

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.



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TECHNOLOGY UPDATE

# Big sound from a stereo radio—without the big price!

*Zenith Audio, a leading electronics manufacturer designs a "Small Footprint", "Big Sound" stereo system and drives the price below $100.*

*by John Jameson*

I leaned back slowly in my chair with my eyes closed, listening to the haunting melody of a Mozart symphony. The acoustics were flawless, and the room was soon filled with full, rich stereo sound. From the crisp highs of the flutes to the tooth-rattling bass of the kettle drums, the music was crystal-clear and powerful. I could distinguish the distinct sounds from each individual musician, and as the orchestra reached the finale I almost fell out of my seat from the awesome force of the music. As the music faded, I leaned forward and hit a button on the stereo clock radio. I had a concert to go to that night—it was time to check the weather.

**Ultimate sound machine.** Zenith Audio has developed a Digital Stereo Clock Radio that boasts the acoustic quality and practical features of stereo radios four times as expensive. You'll be amazed at the sound quality and powerful bass you get from a radio this small and this affordable. This stereo radio features an 11-key handheld remote control and an input jack for CD players or other audio sources.

**The best bass.** Many small stereo radios can sound tiny and weak. This unit has an exclusive EXB button for expanded bass performance. It intensifies the lower tones for CD or FM stations, giving you rich, full and powerful stereo sound. If you want to listen to the stereo in private, there is a headphone jack on the side of the unit.

**Loaded with features.** You won't find a tabletop stereo with more added options. The AM/FM radio features digital tuning for pinpoint reception and crystal-clear sound. The STEREO indicator allows you to tune in to the stereo signal. It also picks up **TV** and **WEATHER** signals with 13 TV channels and 7 Weather channels, so your Zenith Audio Clock Radio is a great source of news, entertainment and information. You can program the unit's memory for 37 preset stations, and the tuning buttons can operate either manually or in a automatic search mode.

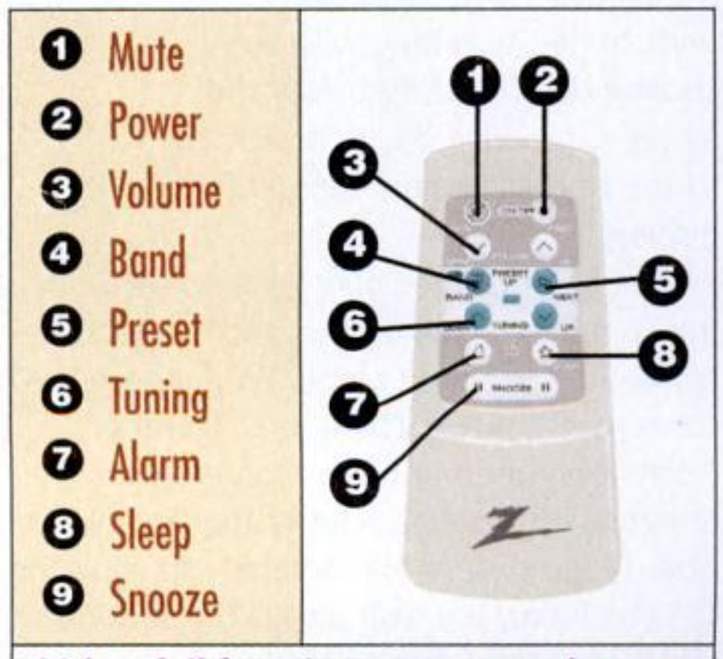
**Practical functions.** The backlit clock has several alarm functions, so you can wake to either radio, TV, Weather or a buzzer. The sleep timer allows you to fall asleep to up to 90 minutes of music, TV or weather and then shuts off automatically. In the morning, if you need a few extra minutes of sleep, press the SNOOZE bar on the control panel or on the remote. The radio or alarm tone stops for 10 minutes and then sounds again. The process can be repeated several times as required. The unit's battery backup system will maintain the time, alarm and preset station memories in the event of a temporary power interruption. There is even a low battery indicator so you'll never oversleep in the event of a power failure.

**Factory direct risk-free offer.** You can spend hundreds of dollars more on a stereo radio, but why do it? We get the Stereo Clock Radio direct from Zenith Audio and pass the savings on to you. This product comes with a one-year manufacturer's limited warranty and Comtrad's exclusive risk-free home trial. If you are not satisfied for any reason, simply return it within 90 days for a full "No Questions Asked" refund.

## Micro-Electronic Sound Breakthrough

**State of the art stereo sound quality in a stylish cabinet**

- AM/FM/TV Bands
- Stereo Speakers with Crystal Sound System
- Digital Weather Band
- 37 Preset Station Memories
- Ascending Tone Alarm
- Wake/Sleep to Radio, Weather or TV Band
- "Fail-safe" Alarm System




*11-key full function remote works up to 15 feet away.*

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## Compact Speakers with a Big Sound




**The Zenith Audio Clock Radio has an exclusive EXB button for expanded bass performance. It intensifies the lower tones for CD or FM stations, giving you rich, full and powerful stereo sound.**

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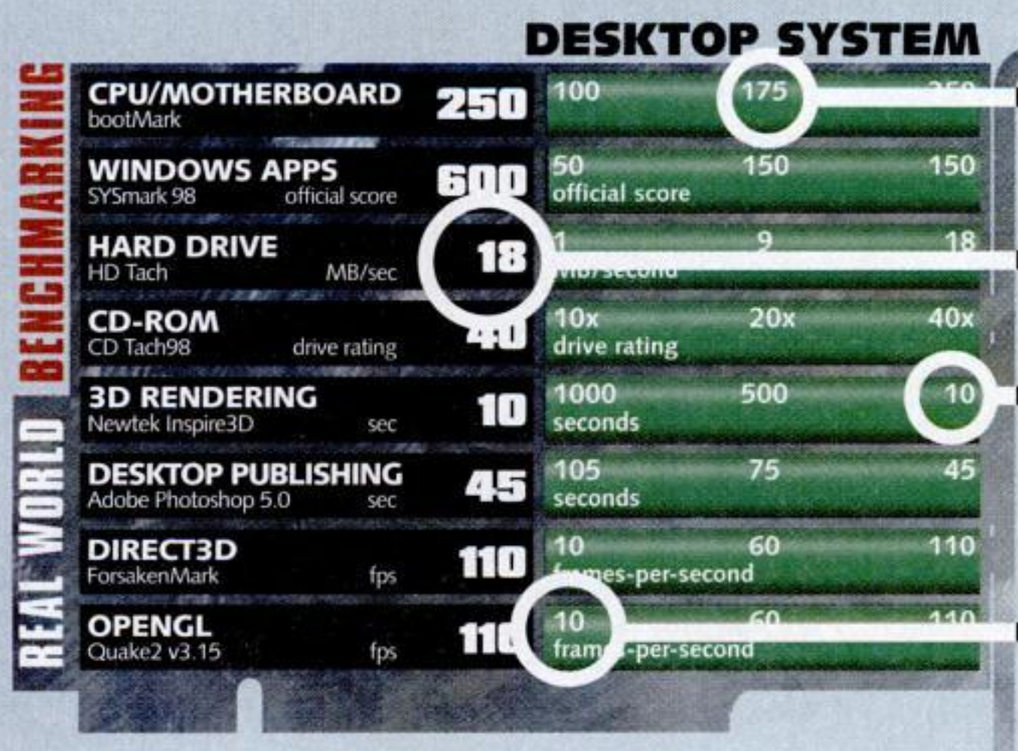
# Testing Policy

Our product evaluation process is built on down-and-dirty, hands-on testing. All hardware benchmarking is conducted in the Maximum PC lab by Maximum PC editors, and, whenever possible, we use real-world applications to gauge performance. Our final verdicts are based on benchmark results and a subjective appraisal of product features.

**EDITOR'S CHOICE AWARD:**
Only 9 and 10 verdicts are even eligible for the coveted Kick Ass award, the mark of PC excellence.

## Online Guide to Benchmarking

Go to **www.maximumpc.com/benchmarking/benchmarking.html** for the complete explanation of *Maximum PC*'s benchmarking policies.





KICKIN' THE TIRES ON THE LATEST HARDWARE AND TAKIN' THE LATEST SOFTWARE OUT FOR A SPIN

Hardware Photography by
**AARON LAUER**





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### UNIVERSAL DISC FORMAT (UDF)

The current crop of DVD-RAM drives ship with Software Architects' (SAI) *Write DVD!* and *Format UDF!* software. Although these drives shipped with different versions, we updated the test machines with the current patches on the SAI web site (**www.softarch.com**) to equalize the testing platform. *Format UDF!* gives you the ability to format a cartridge in FAT16, UDF, and even FAT32 (with the latest patch). Formatting a cartridge as UDF took less than a minute, and up to two minutes in either FAT16 or FAT32 on both drives. *Write UDF!* also gives you the ability to use SAI's file-system driver or the OS-embedded UDF file-system driver.

The Universal Disc Format (UDF) file system is completely different from FAT16-based file systems or even the ISO 9660 CD-ROM file system. UDF overcomes the partition size limitation that exists with each of those, and supports very long filenames of up to 255 ASCII characters or 127 Unicode characters (meaning you can use characters such as \ / : * ? " < > |, which you can't use with Windows). UDF doesn't have a directory depth limitation like ISO 9660. It also handles block sizes (2K) more efficiently. Overhead is also reduced, as a single file is managed as one single entity, regardless of its size. But UDF's strongest feature is its full cross-platform compatibility. This makes files easily transportable between PCs, Macintoshes, and any other OS that supports UDF.

# DVD-RAM Drives

## They're here, and Bob Hope still lives!

The idea of rewritable DVD had many people salivating. That is until the inevitable standards war began. Two distinct standards have emerged. DVD-RAM is DVD Forum-approved, whereas DVD +RW—backed by Sony, HP, and Philips—is not. Each standard uses a different size, writing technique, and media material. And predictably, each is incompatible with the other. But while DVD +RW drives are MIA, DVD-RAM is now available.

Instead of passing judgment on the technology, we've opted to lay the pros and cons of DVD-RAM out for you and judge the drives based on adherence to specifications and benchmarks.

First off, DVD-RAM is not to DVD what CD-R is to CD-ROM. DVD-RAM is actually another removable storage solution altogether. The discs burned on a DVD-RAM drive cannot be read in a conventional DVD-ROM drive (yet ) because DVD-RAM media is bound in a cartridge (more on this in the DVD-RAM Media sidebar). Also, DVD-RAM media holds only 2.6GB of data (about an hour of DVD-Video), while a typical DVD-ROM media can hold 4.7GB of data. But DVD-RAM drives read all types of CD formats, in addition to DVD-ROM media. Also, DVD-RAM media has a shelf life of 30 years and currently sells for approximately 1 cent per megabyte. In fact, Hi-Val sells 5.2GB dual-sided media for $34!

Since DVD-RAM is Forum-approved and standardized by Book E, all DVD-RAM drives and cartridges are compatible with one another. In fact, the Optical Storage Technology Association (OSTA), which pushed the multiread specification, recently formed a subcommittee that will guarantee compatibility of all optical devices with regards to both DVD-RAM and DVD +RW. This is a good thing, since the next-generation DVD-RAM drives will support the full 4.7GB capacity.

*—Sean Cleveland*

## Hi-Val DVD-RAM Kit

Hi-Val delivers the best DVD-RAM solution we've seen. In addition to Panasonic's LF-D101U drive, the kit also offers an Adaptec 2904 SCSI card and a Kick Ass Sigma Hollywood+ decoder card (reviewed in the January 1999 issue). A trial version of *XingMPEG Encoder* is also included.

**Hi-Val's Panasonic LF-D101U drive excels in performance, features, and price.**

Under the gun, the drive reads DVD discs at a 2.1x speed (2.8MB/sec) using Zoned Constant Linear Velocity (ZCLV) technology and plays CD-ROMs back at 17x (2.9MB/sec) specified speed using CAV technology. Reading from DVD-RAM media is a 1x speed affair (1.3MB/sec) and writing is half that (570K/sec). In fact, our real-world copy test took an hour and a half to copy 2.38GB worth of data (Iomega's 2GB Jaz copies 1.85GB of data in 35min). This is still better than rewritable CD-ROM. This level of performance is to be expected from a first-generation drive and will only improve as the technology matures. We were quite impressed with the drive's low random-access scores—something we didn't expect.

What sets the Panasonic drive apart is its ability to read and write Phase-change Dual disk (PD) media. It's these kinds of features that ensure a new technology's staying power.

With the best performance and features, and a complement of additional peripherals, the Hi-Val kit just can't be beat. Even on price.

**PLUSES**
- Lowest price
- Best bundle
- Best audio extraction speed
- PD read/write capabilities
- Fastest CD-ROM performance

**MINUSES**
- Slow DVD-RAM read/write performance

**THE SPECS**

| | |
|---|---|
| INTERNAL BUFFER SIZE | 2MB |
| SCSI CONNECTOR TYPE | 50-pin internal ribbon |
| LOADING MECHANISM | Front-end loading |
| TOTAL/FORMATTED CAPACITY | 2.6GB/2.38GB |
| BUNDLE | One 5.2GB Panasonic dual-sided DVD-RAM disc |
| MEDIA SUPPORT | DVD-RAM, DVD-R (disk-at-once), DVD-ROM, CD-R, CD-RW, CD-Extra, CD-Audio, CD-DA, Video CD, PhotoCD, PD |

**MAXIMUM PC VERDICT**

**Price** $525 (+ SCSI: $575; + MPEG: $645; + Both $665)
**Company** Hi-Val
**Phone** 714.953.3000
**URL** www.hival.com

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# Hitachi GF-1050 DVD-RAM Drive

Hitachi, one of the innovators of DVD-RAM, delivers a drive that performs solidly to specs, but lacks awe-inspiring performance and innovative features. The drive itself includes an advanced caching system for enhanced reads and writes, but our benchmarks didn't indicate anything special.

The GF-1050 reads DVD discs at 2.1x (2.8MB/sec) using ZCLV technology, but plays CDs at only 8x (1.2MB/sec), also using CLV technology. This means the drives read at a constant rate across the whole drive. Not quite the 11x to 20x speed the Panasonic drive delivers. Reading and writing DVD-RAM media is on par with the Panasonic drive, although random access times were much higher. It took almost two hours to complete the same random-access test the Panasonic drive performed in three-quarters of the time. Also, audio-extraction speeds were roughly half that of the Panasonic.

**PLUSES**
Performs to spec

**MINUSES**
Slowest DVD-RAM read/write performance
Slowest CD-ROM performance

Hitachi doesn't include any additional peripherals or software, and the drive features are much the same as Panasonic's, although it doesn't read/write PD media. An external fan is connected to the back of the drive (hanging about a half-inch off the back, which may affect the tight spacing inside your case). The drive performs true to spec, but when compared to Hi-Val's offering, it fails to impress. Especially on price.

**The Hitachi GF-1050 is a solid drive, but pales next to Hi-Val's offering.**

**THE SPECS**

| | |
|---|---|
| **INTERNAL BUFFER SIZE** | 1MB |
| **SCSI CONNECTOR TYPE** | 50-pin internal ribbon |
| **LOADING MECHANISM** | Tray loading |
| **TOTAL/FORMATTED CAPACITY** | 2.6GB/2.38GB |
| **BUNDLE** | One 5.2GB Maxell dual-sided DVD-RAM disc |
| **MEDIA SUPPORT** | DVD-RAM, DVD-R, DVD-ROM, CD-R, CD-RW, CD-Extra, CD-Audio |

**MAXIMUM PC VERDICT**

**Price** $799
**Company** Hitachi
**Phone** 800.448.2244
**URL** www.hitachi.com/storage

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**DARE TO COMPARE**

| MANUFACTURER | HITACHI | HI-VAL |
|---|---|---|
| DRIVE MANUFACTURER/MODEL | HITACHI GF-1050 | PANASONIC LF-D101U |
| Advertised DVD-ROM / CD-ROM speed | 2x / 8x | 2x / 20x |
| **DVD TACH BENCHMARKS[1]** | | |
| Drive rating[2] | 2.1x | 2.1x |
| Min./Max. 32K seq. read (MB/sec) | 2.8 | 2.7 |
| Random access time (ms) | 127 | 98 |
| DVD 1x CPU utilization | 21% | 22% |
| DVD 2x CPU utilization | 44% | 42% |
| 2K Interface burst speed (MB/sec) | 16.8 | 17.1 |
| 8K Interface burst speed (MB/sec) | .10 | 3.4 |
| 32K Interface burst speed (MB/sec) | .30 | 7.1 |
| **CD TACH BENCHMARKS[3]** | | |
| Drive rating[4] | 8.0x | 17.2x |
| Min. 16K seq. read (MB/sec / drive rating) | 1.2 / 8.0x | 1.6 / 11x |
| Max. 16K seq. read (MB/sec / drive rating) | 1.2 / 8.0x | 2.9 / 20x |
| Random access time (ms) | 197 | 102 |
| 4x CPU utilization | 2% | 2% |
| 8x CPU utilization | - | 3% |
| 12x CPU utilization | - | 4% |
| 2K Interface burst speed (MB/sec) | 1.0 | 1.1 |
| 8K Interface burst speed (MB/sec) | 3.7 | 3.2 |
| 16K Interface burst speed (MB/sec) | 4.3 | 4.6 |
| **HD TACH BENCHMARKS[5]** | | |
| Average read speed (MB/sec) | 1.3 | 1.3 |
| Average write speed (MB/sec) | .52 | .57 |
| Random access time (ms) | 300 | 199 |
| Read burst speed (MB/sec) | 6.6 | 6.4 |
| CPU utilization | 2.8% | 2.3% |
| **REDBOOK AUDIO EXTRACTION[6]** | | |
| Extraction speed[7] | 4.6x | 9.5x |
| **REAL-WORLD BENCHMARKS[8]** | | |
| Time to copy 2.6GB (hr:min:sec) | 1:56:16 | 1:27:52 |

Tested on a Micron Millennia Pentium II 400MHz w/64MB, [1]Tests DVD-ROM performance, [2] 32K weighted average, [3]Tests CD-ROM performance, [4]16K weighted average, [5]Tests reading/writing to DVD-RAM media, [6]Converting CD Audio to a .wav file, [7]Using Adaptec's *Easy CD Creator* system test, [8]Copying data to DVD-RAM media

## DVD-RAM MEDIA

DVD-RAM media comes either single-sided (2.6GB) or double-sided (5.2GB). Both are encased in a protective plastic cartridge and only single-sided Type-2 media can be removed from the cartridge (shown below). The actual disc utilizes a phase-change film material that is altered by the laser when data is being written. The head then reads the different reflective properties of the altered and unaltered film (much like PD or CD-RW). But even though the discs can be removed, it's best that you leave them in the case, as the slightest scratch can ruin them.

The drives utilize a "wobble land groove" recording method. The land-groove method records signals on both the lands (the areas between the grooves) and on the grooves themselves, while the wobble method lays the tracks out so they are not symmetrical (moving slightly to the left and right) where clock data is kept. The embossed pits (pictured) hold addressing (header) information used to help locate data. DVD-RAM drives use a Zoned Constant Linear Velocity (ZCLV) rotational control.

**The removable Type-2 DVD-RAM media shown here cannot be read in any current DVD-ROM drives. And although the next generation of DVD-ROM drives will include support, it'll be risky due to the delicate nature of the media's surface—a single scratch to the film material can render a disc unreadable.**

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.



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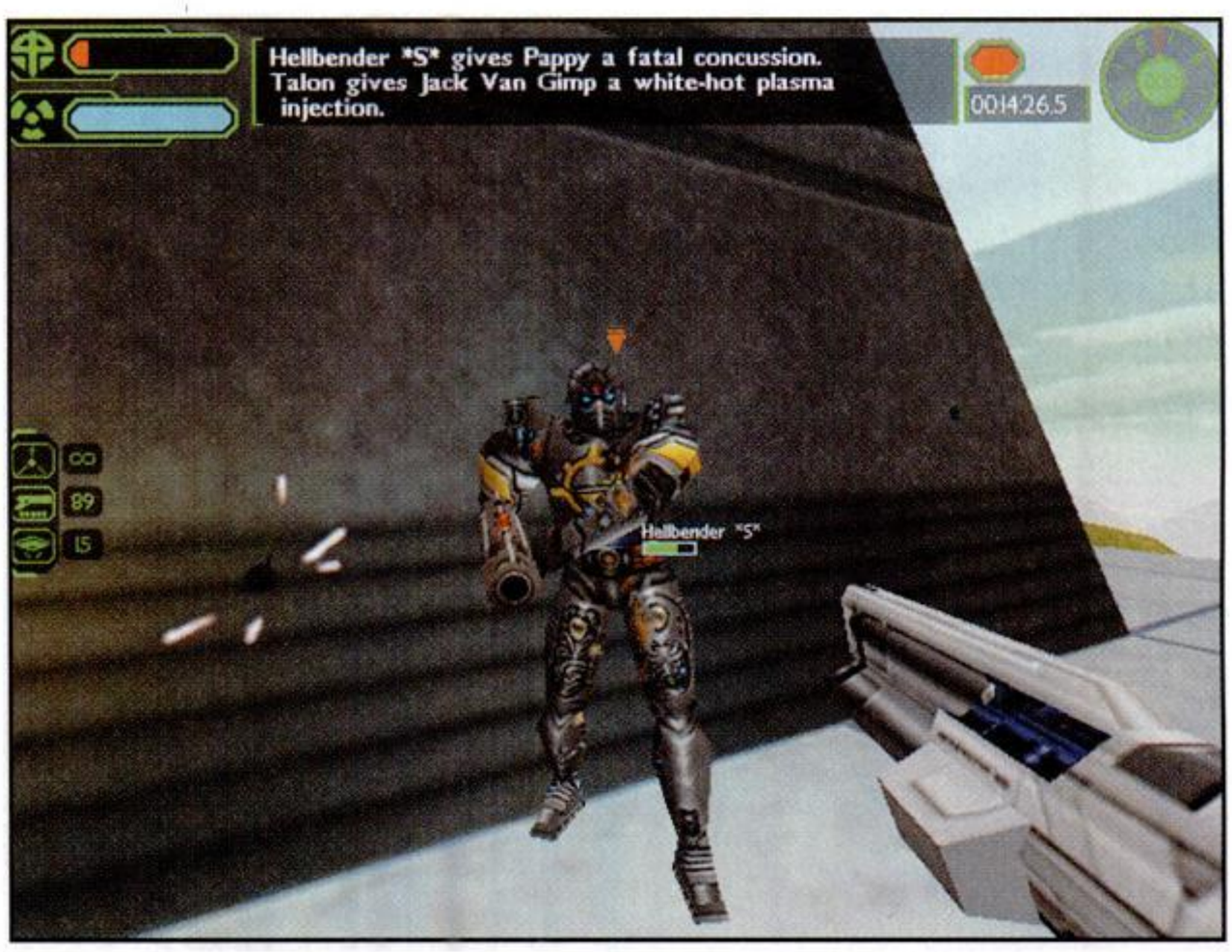
# Starsiege: Tribes

## Think locally, frag globally

*This month, Online Editor* **Gordon Ung**, *and Senior Editor* **Andrew Sanchez** *team up to take on* Tribes, *the multiplayer-only blast-fest set in the* Starsiege *universe.*




**THE SPECS**

**3D CARD SUPPORT**
Glide

**MULTIPLAYER**
TCP/IP
IPX

**PLUSES**
- Gorgeous defoliated maps and interior corridors
- New multiplayer abilities such as use of air ships and the manning of remote turrets and rocket launchers
- George Jetson Jetpack
- Network latency minimal no matter how many players on map

**MINUSES**
- Multiplayer only: no single-player missions other than tutorials
- Lacks good communication
- Commander mode not powerful enough
- Not enough maps
- Glide only

**Gordon** *Tribes* isn't just a game. It's a university study of group dynamics and sociology answering the eternal question, "If you put 32 strangers in an Internet first-person shooter, do you get the Dream Team or Lord of the Flies?" Truth is, it's a crapshoot most of the time. Join a team of hotheaded mavericks accustomed to doing it their way, and you'll get spanked hard. Add to that your rogue 12-year old "Team Killers" recently ejected from *Ultima Online*, and you have a recipe for disaster. But when you join an intelligent group of players, the results can be magical. Responsible Tribespeople set gun turrets to protect your base, man rocket launchers, and assume responsibility for repairing destroyed equipment. Still, I wish Dynamix had invested a bit more time to groom the new players before they get on the server and muck things up.

**Andrew** Dynamix could have prevented that problem by instituting intense single-player training exercises. Each player would be ranked according to how well they completed the tests, then the ranking could be used to filter out the snot-nosed Privates from the more capable corporals or sergeants.

**Gordon** My problem with the game is that the commander mode isn't developed enough to direct a good offense. Dynamix should have forced players to pick a commander as each map begins, and that commander should be given the ability to eject unruly or insubordinate players.

**Andrew** I agree. It would have been nice if the game placed you in a squad or platoon headed by a leader who reports to a Field Commander who oversees everything. There simply isn't any cohesive chain-of-command here.

**Gordon** But what *Tribes* lacks in command structure, it makes up for in its stunning visuals. There's a feeling of wide-open space that you don't get in the multiplayer versions of, say, *Half-Life* and *Quake II*.

**Andrew** Well, being based on Dynamix's latest texture-mapped polygon engine helps tremendously. The ability to shift seamlessly between indoor corridors and outdoor vistas is *Tribes'* biggest visual strength. But 256x256 maximum texture size (thanks to its Glide-only 3D support) and a lack of soft cover, such as trees, to hide behind, makes the battlefield barren and devoid of any real detail. Weapon explosions are dramatic, as are the procedural footprint textures and the motion-captured movement. OpenGL is promised in a forthcoming patch, but Direct3D users are out of luck.

**Gordon** But what about those guns? Weapons build outs are balanced for the great outdoors. There's no BFG to wipe out a roomful of opponents. With *Tribes*, players have to learn accuracy and leading. Weapons are neutralized depending on the map.

**In Tribes, giving this armored chump his hot-lead injection is part of your marching orders, so hop to it, soldier.**

**Andrew** Come on: those weapons are uninspiring. Let's see, I have an energy blaster, a big energy blaster (plasma gun), and a sniper energy blaster.

**Gordon** Still as an online-only game, *Tribes'* performance over V.90 connections is outstanding. I can hardly tell the difference between analog modem at home or T-1 at work. It's not like *Quake II*, where you're at the mercy of low-ping jerks. Overall, *Tribes* is a great game, providing you recognize the limitations of multiplayer only and its inability to enforce stronger squad organization. In a class by itself, *Tribes* may be king until *Quake Arena* or *Team Fortress* hit the net.

**You'll have to wait your turn in order to get supplies—kind of like the men's bathroom.**

**MAXIMUM PC VERDICT**

**Price** $40
**Developer** Dynamix
**Publisher** Sierra
**Phone** 800.757.7707
**URL** www.sierra.com/dynamix

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# WinBook XL²

## This notebook's a winner

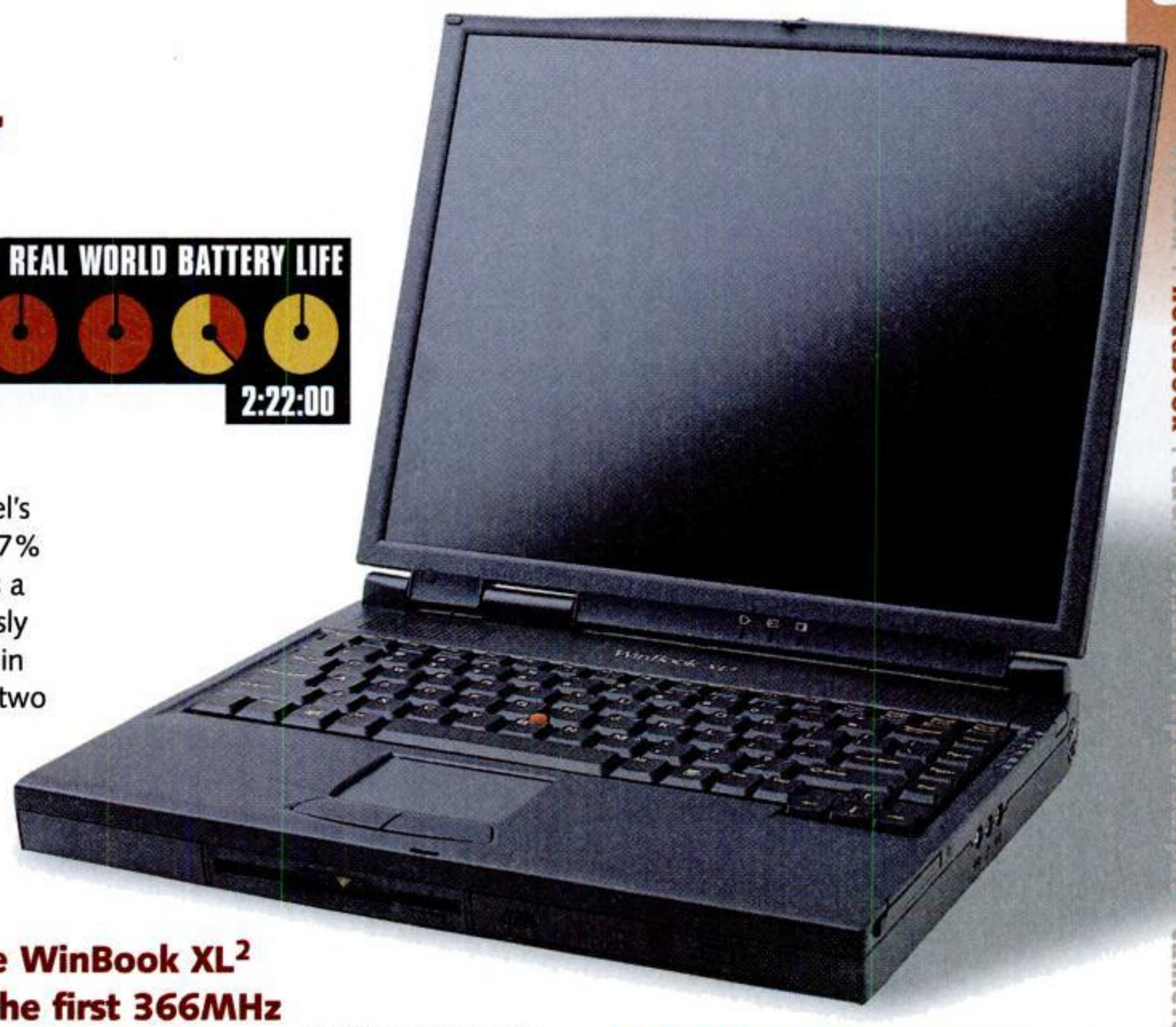
MAXIMUM PC KICK-ASS! product

The WinBook XL²—which features Intel's latest mobile processor, the 366MHz Pentium II—arrived on our doorstep exactly 366 days before the dawn of the new millennium.

Coincidence? There's nothing conspiratorial about the XL²'s performance. It rocks.

Compared to the 300MHz mobile Pentium II, Intel's latest progeny—as expected—performed between 17% and 28% faster during our hardcore system tests. As a result, the XL² broke the benchmark records previously set by Dell's divine Inspiron 7000 D300LT (reviewed in October 1998). And we're not talking about one or two benchmarks either. We're talking about *all* of them. The biggest jumps overall were in *Photoshop 4.0* and SysMark 98, which saw performance spikes of 28% and 27%, respectively.

REAL WORLD BATTERY LIFE
2:22:00



**PLUSES**
- 366MHz mobile Pentium II
- Terrific DVD playback
- Built-in modem
- Multiple pointing devices
- SuperDisk

**MINUSES**
- Single USB port
- 4MB video memory limitation
- No Zip drive

But while the XL² is one tricked-out notebook, it's thankfully not a one-trick pony, because in addition to the 366MHz mobile Pentium II, it's also juiced up with a 2x DVD-ROM (with hardware-assisted MPEG-2), a 14.1-inch TFT display, 2x AGP graphics courtesy of ATI's ever-dependable LT Pro chipset, an integrated 120MB SuperDisk, and a 56K modem.

**The WinBook XL² is the first 366MHz notebook we've reviewed, and as expected, its performance and features are rock solid. With a few minor adjustments it could've scored a 10.**

There are only two things we didn't like about the XL²—and they both involve multimedia. With DVD-equipped notebooks, we prefer an external volume control, and while there's certainly space on the case, one isn't incorporated. And although the XL² handled Direct3D and OpenGL gaming with ease, tendering the highest framerates we've seen in a notebook (almost 40fps in *Forsaken* at 800x600), we still would've preferred an additional 4MB of video memory to smooth the textures even more.

But WinBook gets kudos for installing ATI's latest video drivers, a seemingly simple task that many vendors fail to do. DVD video playback, by the way, was absolutely stunning, with nary a tear or shear.

The use of the SuperDisk drive is interesting (a Zip would've been better), but strangely, no SuperDisk media was included.

Other XL² notables include the color-accented keyboard and dual navigation devices (the trackpad and pointing stick can be used simultaneously!). The dual PC card slots are positioned one on each side of the case, but beware, they're not Type III compatible.

Despite its minor shortcomings, the XL² is still worthy of your exploration.

*—Bryan Del Rizzo*

**UNDER THE HOOD**

| | |
|---|---|
| **THE BRAINS** | |
| CPU | 366MHz Intel mobile Pentium II |
| RAM | 128MB SDRAM (expandable to 256MB) |
| I/O Ports | Dual PC card, parallel, serial, external monitor, TV-out, S-Video-out, single USB, single PS/2, IrDA, microphone-in, headphone-out, line-out |
| Modem | Built-in 56K V.90 modem |
| **DISPLAY** | |
| Videochip | ATI Rage 3D LT Pro AGP 2x with 4MB SGRAM |
| Display | 14.1-inch TFT |
| Res/Depth | 1024x768/32-bit |
| **STORAGE** | |
| Hard Drive | Toshiba 6.4GB Ultra DMA |
| DVD-ROM | Toshiba 2x with hardware-assisted MPEG-2 decoder |
| **SOUND** | |
| Sound | ESS Maestro wavetable/FM audio with 3D spatial enhancement |
| Speakers | Stereo speaker |
| **TIPPING THE SCALES** | |
| Lap Weight | 8 pounds, 6 ounces |
| Carry Weight | 7 pounds, 8 ounces |

BOOT 1:06 DOWN 0:04

**REAL WORLD BENCHMARKING**

| | | |
|---|---|---|
| CPU/MOTHERBOARD bootMark | | 166.5 |
| WINDOWS APPS SYSmark 98 | official score | 155 |
| HARD DRIVE HD Tach | MB/sec | 6.7 |
| CD-ROM CD Tach98 | drive rating | 13.5x |
| 3D RENDERING Newtek Inspire3D | sec | 568 |
| DESKTOP PUBLISHING Adobe Photoshop 5.0 | sec | 81 |
| DIRECT3D ForsakenMark | fps | 39 |
| SPREADSHEETS Microsoft Excel 97 | sec | 152 |

**MAXIMUM PC VERDICT**

**Price** $3,399
**Company** WinBook Corp.
**Phone** 800.468.2162
**URL** www.winbook.com

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For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.



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# HomeSite 4.0 vs. Dreamweaver 2

## Build a better web site

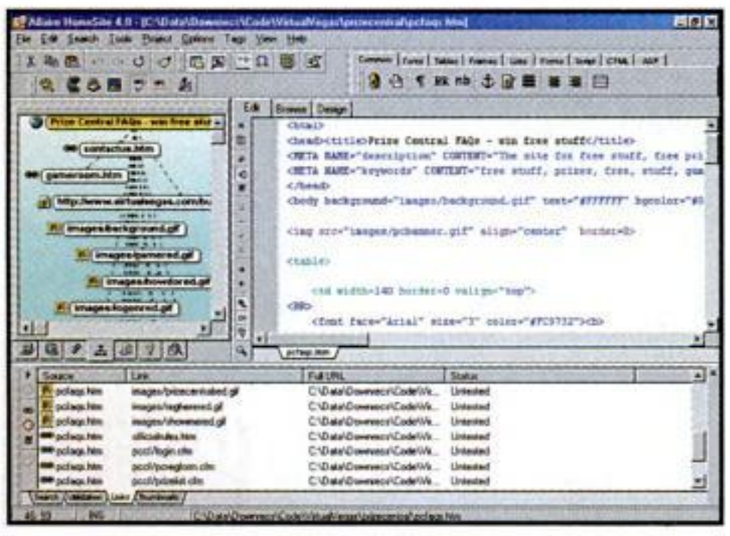
You don't need to be a code monkey to build a quality web site. The two HTML editing and authoring apps here write the code so you don't have to. Building a page is as easy as pointing and clicking on the multitude of interactive options provided.

Right up front, we can confirm that neither of these products clutter up your pristine HTML pages with redundant or outright garbage characters—a common criticism of Microsoft's *Front Page* editor.

*—Nels Johnson*

## HomeSite 4.0

An important improvement offered by *HomeSite 4.0* is its Design mode. This allows you to enter and format text and certain types of controls as if you were working in a GUI-based word processor or page-layout program. The underlying HTML code is generated automatically, then you can fine-tune it in standard Edit mode and check the final results in Browse mode. Switching among these three modes is done easily with tabs on the main editing window. Design mode is especially useful for tweaking hard-to-manage tables and forms with different numbers of Table Data cells in multiple rows.



**HomeSite's core strength is the way is lays out edit windows, control elements, and toolbars.**

While you would expect such luxury, *HomeSite 4.0* provides a wealth of detachable toolbars and toolbar items for inserting new HTML objects and modifying existing objects and straight text. Color-coding of text, tags, scripts, comments, and other types of HTML data is automatic and sensible. Among the script types supported are JavaScript, ASP (for Microsoft's Active Server Pages), and Allaire's *Cold Fusion* language (CFML) for integrating web pages with back-end databases.

Numerous wizards are included for such chores as setting up frames, forms, and tables from scratch, not to mention a spell checker, and link and tag validation tools for overall site management. Plus you can edit and test HTML pages on remote servers via an FTP connection and a document-weight tool for gauging page-download times. Finally, there is a powerful search-and-replace facility that reports useful statistics on S/R operations just performed. We tested this feature on a 25,000-page site with perfect results and meaningful heuristics.

With its extensive help system (covering both its own features as well as a full HTML guide, plus examples), *HomeSite 4.0* builds on the excellent reputation of its previous version with an even more configurable UI. Next time around, we'd like to see a more powerful design mode for dynamically resizing tables and frames, and also a spider-web map view of an entire site (like with *Front Page*, despite the garbage).

**MAXIMUM PC VERDICT**

**Price** $99
**Company** Allaire
**Phone** 888.939.2545
**URL** www.allaire.com

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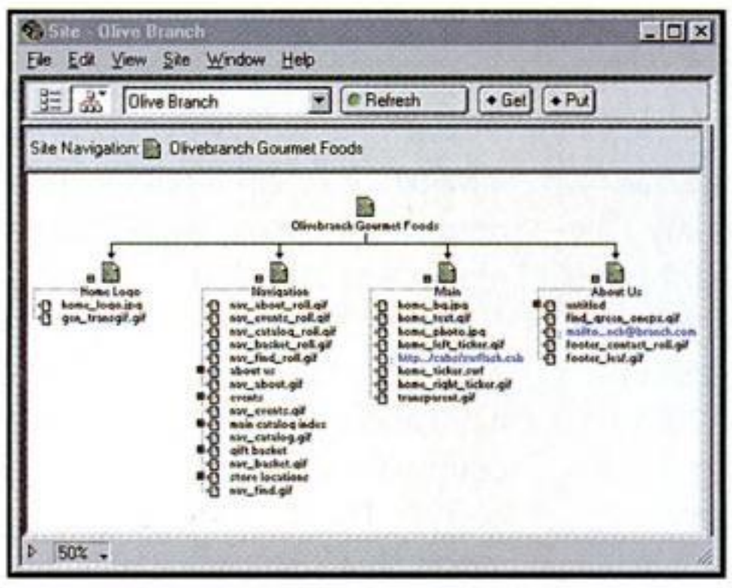
## Dreamweaver 2

Many people believe *Dreamweaver* is the best product in its class. Like *HomeSite 4.0*, it features a Design mode for visual page design (*Dreamweaver* had it first and currently does it better) that can enhance user productivity by an order of magnitude, but that's just the beginning. Throughout this product, Macromedia stresses so-called Roundtrip HTML and What-You-See-Is-What-You-Serve technology, which makes possible visual rendering of dynamic, server-side content within the Design-mode window. This is a significant enhancement on what *HomeSite 4.0* offers.

It's fair to say that, feature for feature, *Dreamweaver 2* at least matches the wealth of tools found in *HomeSite 4.0*, although there are some differences. For instance, XML receives more support. XML gives web designers the ability (among other things) to absolutely position page elements for all browsers that support it. Also, *Dreamweaver* is tightly integrated with Macromedia's Flash and Shockwave technologies. Other excellent features include high-level browser type and version detection, reports of which HTML objects work in which browser environments, superior table management, and a process for turning *Photoshop* comps into high-quality web graphics.




**Dreamweaver's Site Map lays out all site components into a clean, intuitive, color-coded two-dimensional format.**

The real advantage of *Dreamweaver 2* over *HomeSite 4.0* is its site management capability. The interactive site map is arguably better than the one in *Front Page*, and the facility for tracking changes and automatically updating all links is a feature currently unmatched in most other HTML editors. *Dreamweaver*'s only significant fault may be that it feels almost over-designed when you first get into it (as evidenced by its more abstract toolbars and buttons), which makes for a steeper learning curve than with *HomeSite*. Plus, it has a significantly larger RAM footprint.

According to some, Windows Notepad is still the most widely used HTML editor. While it's hard to fault this simple tool, serious web design, construction, and maintenance now require solutions with many more functions and special features to get professional sites built and updated on time. Both *HomeSite 4.0* and *Dreamweaver 2* are excellent candidates for this job, but *Dreamweaver* is just better.

**MAXIMUM PC VERDICT**

**Price** $299
**Company** Macromedia
**Phone** 800.457.1774
**URL** www.macromedia.com

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# Make Money In A Computer Career!

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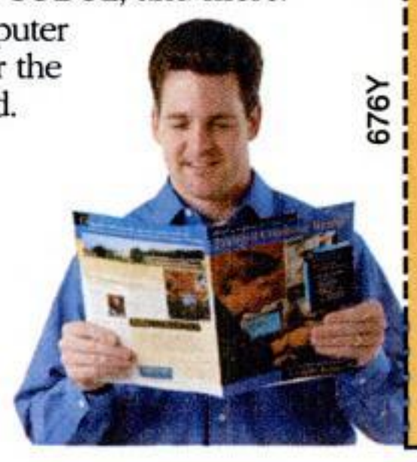

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# Image Editors for Everyone

## Not everyone needs Photoshop

Professional designers depend on industrial-strength image-editing applications such as Adobe *Photoshop* to create great graphics, but there is an easier and less expensive way for the rest of us. The following new image editors give much of the same power for less than $150. And you don't need a degree to figure out how to use them.

*—Linda Lee*

## Ulead PhotoImpact 4.2

MAXIMUM PC KICK-ASS! product

When it comes to creating great-looking images on a budget, Ulead *PhotoImpact* is tough to beat. Though it's clearly geared toward creating images for the web, it can also be used to generate images for newsletters and presentations.

A Microsoft Office-compliant interface makes *PhotoImpact* easy and comfortable to learn, and up to 99 levels of undo make experimentation painless.

A few of *PhotoImpact*'s most flexible features include its automatic image-processing tools, a highly functional Post-Processing Wizard, and powerful manual image-enhancement controls. You can selectively apply Auto Process steps such as contrast, brightness, and focus, or set up a Batch process. Unfortunately, we weren't very pleased with the Auto Process results. Auto brightness was heavy-handed, auto contrast caused unsightly blotches in areas of our picture, and auto focus made our image too grainy. Don't get us wrong, we like the idea of the Auto Process, but in the next rev, we want to have independent control over each module. *PhotoImpact*'s Post-Processing Wizard incorporates more steps than those offered by its competitors and walks you through the basic image-enhancement process, from alignment to applying a frame. We especially like the range of Focus choices and the Advanced menu options for Brightness and Contrast, which let you modify individual color channels via sliders, numerical entry, or *Photoshop* Variations-style thumbnails. The manual image enhancements offer similar depth. We were thrilled to find that the Tone Map enables you to selectively modify individual color channels by shadows, midtones, and highlights.

SmartSaver lets you specify quality, **compress, file type for GIF, JPEG, PNG.**

On the creative side, there are also dozens of amazing special effects—ranging from natural painting effects to camera lenses—that you can customize according to your preferences. Among our favorites is a fun particle generator for creating effects such as rain, clouds, and stars.

Another small thing we loved is that *PhotoImpact* provides important file data—such as size, format pixel size, resolution, and modification time—before you open an image. This is important if you have multiple versions of images for web and print use.

Creating web graphics is where *PhotoImpact* truly excels. Under the web option on the menubar there's an interactive button designer that comes complete with light source and a background designer. The software also ships with Ulead's *GIF Animator*, a separate program for creating animations. Other tools include a frame designer, an HTML Assistant, and an image-map tag. Rounding out this feature set is a fantastic SmartSaver application that offers interactive previewing of GIF, JPEG, and PNG images on export.

We did notice a few nit-picky things. If you work primarily with a mouse or graphics tablet, you'll miss not having a crop button when you use the manual crop tool. Instead, you need to use the keyboard shortcut or access the menu item. Also, *PhotoImpact* does not include ready-made projects such as greeting cards and calendars.

**MAXIMUM PC VERDICT**

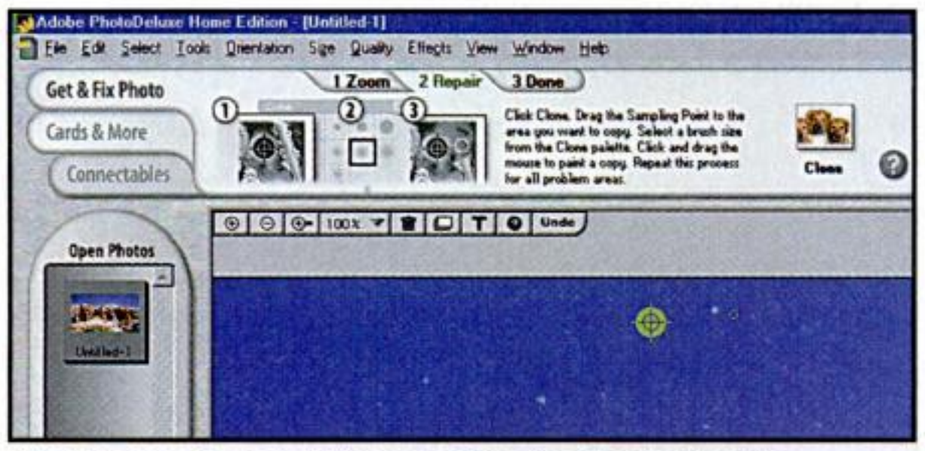
**Price** $99
**Company** Ulead
**Phone** 800.858.5323
**URL** www.ulead.com

**9**

## Adobe PhotoDeluxe 3.0 Home Edition

*PhotoDeluxe* shares much of *Photoshop*'s engine, yet has an interface your mother could use. Unfortunately, that interface begins to annoy over time.

*PhotoDeluxe* lets you choose how to edit images. You can fix an image automatically with Extensis IntelliFix, follow *PhotoDeluxe*'s step-by-step interface (which also incorporates an Auto Fix option), or select the "Advanced Menu" button and access image-editing control directly. By following the many steps to enhance an image or fix a damaged photo, *PhotoDeluxe* offers easy instruction on using the Clone Tool to remove facial blemishes, dust, and scratches. One downside is that the HSL, Contrast/Brightness, and Color Balance commands do not provide individual control over midtones, highlights, or shadows.




PhotoDeluxe leads you through using the Cloning tool to **eradicate dust, fix tears, and remove other blemishes from photos.**

Unfortunately, *PhotoDeluxe*'s heritage comes through in the application's limited creative tools: smudge, erase, and clone. On the other hand, you get dozens of effects—ranging from frames and distortion to collage and textures. Although *PhotoDeluxe* exports all common web file formats, and a wizard walks you through preparing JPEG or GIF files, you cannot preview your image with JPEG compression.

*PhotoDeluxe* offers only one level of undo, but its step-by-step nature does not lend itself to needing more. In spite of its shortcomings, at $49 *PhotoDeluxe* offers an astounding amount of power for the price.

**MAXIMUM PC VERDICT**

**Price** $49
**Company** Adobe Systems
**Phone** 800.492.3623
**URL** www.adobe.com

**6**



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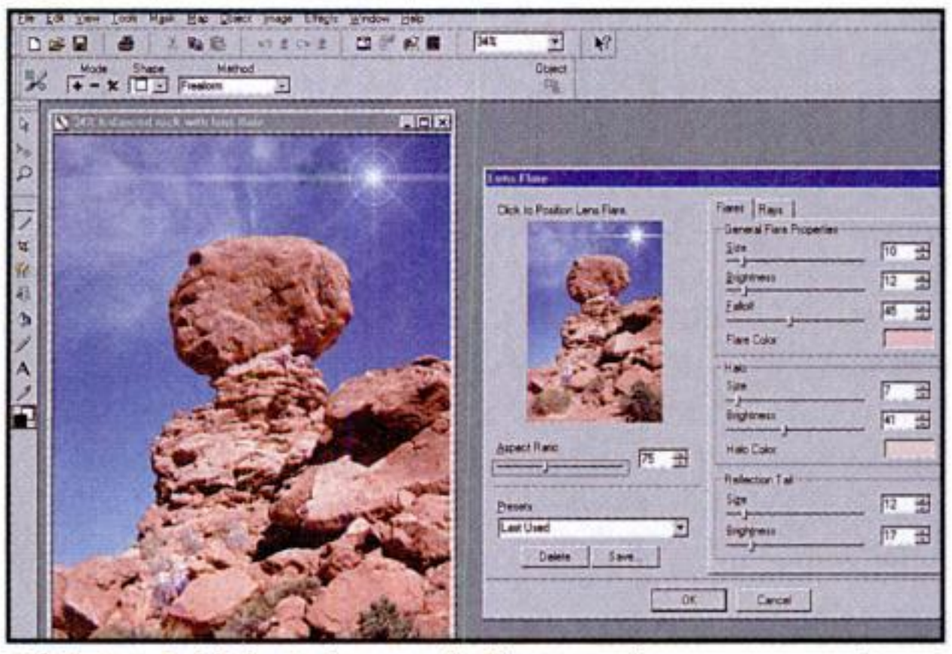
# Micrografx Picture Publisher 8

Micrografx *Picture Publisher* uses a standard *Office*-compatible interface design, making it easily accessible even for first-time users. Though it has only one level of undo, there is a slick Command Center that records all your actions. This lets you selectively delete a command at any time.

The automatic image-enhancement feature of *Picture Publisher* is hidden as the Photo Fix effect, and with good reason. This four-step process is less effective than those of *PhotoDeluxe* or *PhotoImpact*, and the interface for fixing color is difficult to use with small thumbnail previews.

One of our favorite aspects of *Picture Publisher* is its selection of Masking tools. A ruby-colored overlay facilitates this process by covering the nonmasked area. It also boasts a strong assortment of drawing and painting tools. You can specify brush attributes such as size, shape, and transparency. Additionally, there are dozens of effects. Our favorite is the Lens Flare, which lets you specify color, size, falloff, and other characteristics. Other notable categories of effects include camera filters, warp effects, and text effects. On the downside, these complex filters and effects often result in slow rendering times.



**Of Picture Publisher's dozens of effects, my favorite is Lens Flare, which lets you control attributes such as size, color and falloff.**

For web support, *Picture Publisher* includes a simple Web Output Wizard and a JPEG saver with preview. There is also a wizard to make custom Internet separators and a selection of premade web pages on a content CD to get you started.

With its higher price tag, *Picture Publisher* may be a less-desirable option for the budget-conscious. But for those who expect to do more creative work for print or the web, it's a strong contender.

**MAXIMUM PC VERDICT**

**Price** $150
**Company** Micrografx Inc.
**Phone** 888.744.1210
**URL** www.micrografx.com

8

# Jasc Paint Shop Pro 5

Jasc Software's *Paint Shop Pro* excels in its creative possibilities. More so than other products here, *Paint Shop Pro 5* straddles the consumer and professional markets. Unlike the others, *Paint Shop Pro* does not offer an automatic correction tool, nor is there a processing wizard to help instruct the uninitiated. With only four levels of undo, this is not a good option for those who fear experimentation. For those who prefer to learn by the book, the manual includes a comprehensive tutorial section. Unfortunately, it also sports a poor index, and the application's online help is weak.

For those who persist, however, the rewards can be great. The application features standard image-adjustment tools, with an option to preview before committing to an adjustment. One annoying point is that while you can adjust the levels of the highlights, midtones, and shadows, you cannot modify them per color channel, which we expected from a product of this level. However, you can selectively apply many retouch enhancements—such as sharpen, dodge and burn, and saturation—with the retouch brush. In this mode, you can specify brush tip and its attributes, as well as a texture.

The best part of *Paint Shop Pro* is its range of creative options and painting and drawing tools. In addition to standard paint, clone, and eraser brushes, there is a neat picture tube that works like *Painter*'s ImageHose. You can specify brush tip attributes such as shape, size, opacity, and density for an almost unlimited range of styles. Additionally, you can create custom brush tips, and the software ships with 30 preset brush textures.

**The Posterize command reduces the number of bits per color pixel to the specified level. This image has been reduced to 2 bits per pixel.**

Despite its lack of automatic tools, *Paint Shop Pro*'s creative possibilities make this an attractive option for the higher-end of the prosumer crowd.

**MAXIMUM PC VERDICT**

**Price** $99
**Company** Jasc Software
**Phone** 612.930.9800
**URL** www.jasc.com

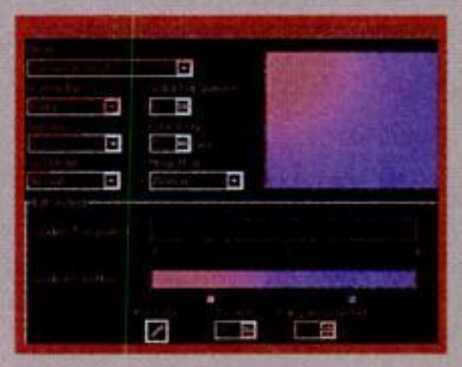
7

## CREATING A WINDOW TO ANOTHER WORLD

Using this technique, you can quickly and easily create a Stargate-style doorway to an alternate realms in your digital images. First, mask the selected area. Here, we used Micrografx *Picture Publisher*'s Freehand Mask tool to create a mask of the area inside the arch that we wanted to turn into a doorway.

Then, select "Edit Points" to make any necessary changes for sloppy masking. The Ruby Overlay tool lets you easily see what area is masked. The red area represents the part of the image that is not masked.

Using the Gradient Fill tool, specify the attributes of the gradient. Here, we used a radial gradient fill with pleasing shades of mauve, purple, and blue to complement the sandstone and sky.



Next, drag the cursor within the masked area to set the radial of the gradient, and your masked area will be filled with a colorful gradient. We wanted the center of Archgate to resemble a swirling pool, so we set this radial gradient to go outward from the center.

If you aren't pleased with how the portal looks the first time, try again until you achieve the effect you want. Don't be discouraged if it takes some experimentation to find the perfect gradient attributes for your image.



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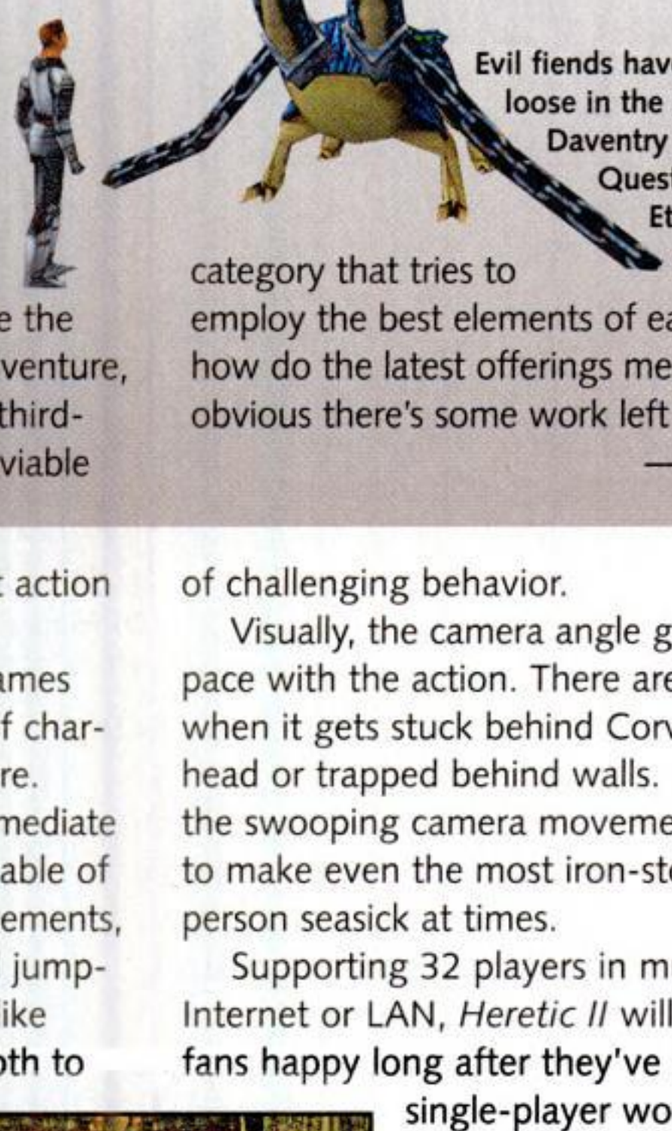
# Out of Body Experiences

## Gaming in the third-person



Evil fiends have been let loose in the land of Daventry in Kings Quest: Mask of Eternity.

Third-person games, unlike their first-person brethren, attempt to employ a strong sense of character and landscape, ultimately resulting in a more immersive environment. Some might argue the trade-off for this is accuracy and control, but developers see this fledgling genre as a means to escape the slush pile. Crossing genre lines of adventure, shooters, and role-playing games, third-person games have matured into a viable category that tries to employ the best elements of each genre. So, how do the latest offerings measure up? It's obvious there's some work left to be done.

*—Dan Simpson*

## Heretic II

Violent magic pervades the universe of Heretic 2. It's gory; it's good.

Dedicated to pure, hell-bent action, *Heretic II* is a parade of gibbous violence set in a detailed fantasy realm. You play Corvus, an Elf who has been thrown into the middle of a demonic bloodbath. Taking the Quake II engine to new heights, *Heretic II* creates an addictive game that's full of what shooter fiends want: adrenaline-driving action.

Bursting with eye candy, *Heretic II* uses an assortment of killer lighting effects to swamp an otherwise drab environment. Prismatic sprays of blood and magic are over the top, which is a testament to the strengths of the Quake II engine and the designers at Raven. *Heretic II* is a gorgeous game. Capable of a whopping 1600x1200 with 16-bit color, pumping an average of 4,000 polygons at any given time, *Heretic II* dazzles in GL. Textures range up to 256x256 and help create a distinct atmosphere and feel in each level. Awesome light sourcing keeps the eyes happy, while the constant action keeps your fingers flying.

Typical third-person games have a abominable lack of character control. Not true here. Corvus's responses are immediate and deftly animated. Capable of a variety of acrobatic movements, such as pole-vaulting and jump-tumbling, Corvus moves like liquid. Adding further depth to *Heretic II* is A3D support, with rich and atmospheric sounds drifting about you.

As much fun as the game is to watch, the gameplay is thin. You'll do little more than run back and forth through a maze of towns or dungeons, pressing buttons and levers to get to the next area. Playing errand-boy over and over gets tiring. As far as level design goes, Raven has sculpted some fine work. There is an awe-inspiring fantasy feel throughout the game, but with epic-sized levels, it's easy to get lost. Furthermore, the AI is just plain stupid and often delves into the "waves of opponents to massacre" scenario. Enemies will either rush you or run away from you, hardly presenting any kind of challenging behavior.

Things get interesting when you get the firewall spell.

Visually, the camera angle generally keeps pace with the action. There are moments when it gets stuck behind Corvus's fat elfin head or trapped behind walls. Either way, the swooping camera movement is enough to make even the most iron-stomached person seasick at times.

Supporting 32 players in multiplayer via Internet or LAN, *Heretic II* will keep shooter fans happy long after they've scoured the single-player world. One particularly nasty trick is to morph your opponents into chickens and chase them around before you slaughter them in an explosion of feathers and blood.

*Heretic II* comes off a slick and polished game, sure to occupy many a weekend hour. With lightning-paced action, quick control responses, and gorgeous graphics, *Heretic II* is chock-full of addictive gameplay.

**MAXIMUM PC VERDICT**

**Price** $50
**Company** Activision
**Phone** 310.255.2000
**URL** www.activision.com

8

## Redguard

The folks at Bethesda have busted their chops in creating the detailed world of the Elder Scrolls. The latest offering of the realm, *Redguard*, is a testament to the designers' creativity and is rife with history and depth. Too bad it doesn't look as good.

In this adventure, you play Cyrus, a sailor searching for his missing sister. Taking a cue from last year's heinous *Battlespire*, Bethesda has finally added 3Dfx support for its aging DOS-based Xngine. While the scenery looks good with a Voodoo card, anyone sporting the latest rigs from nVidia or Matrox will be left in the dust with crummy software acceleration. 3Dfx suppport may be a wolf in disguise, though, as we failed to get a Canopus Voodoo$^2$ board to run with this game. To boot, the Xngine is a relic that brings with it a host of configuration problems. Horrible clipping plagues this game, along with stiff character movements and intermittent crashes. Control issues abound, with stiff, herky-jerky reactions. This is especially problematic when in combat or trying to solve a puzzle, which is most of the time.

Control of Cyrus is a less than pleasant experience.

There's a lot of dialogue in *Redguard*, and often hours pass just talking to someone, asking a horde of questions about so and so and the Crown resistance, or the secret Dwarven machinery in the mountains. There's a lot of history here, and a lot of information for Elder Scrolls novices to pick up at once. *Redguard* might make a better book than a game. Be that as it may, Bethesda has some great ideas. If only its implementation were cleaner, this Elder Scrolls adventure would be the kick-ass game it should be.

**MAXIMUM PC VERDICT**

**Price** $40
**Company** Bethesda
**Phone** 301.932.2000
**URL** www.bethsoft.com

4



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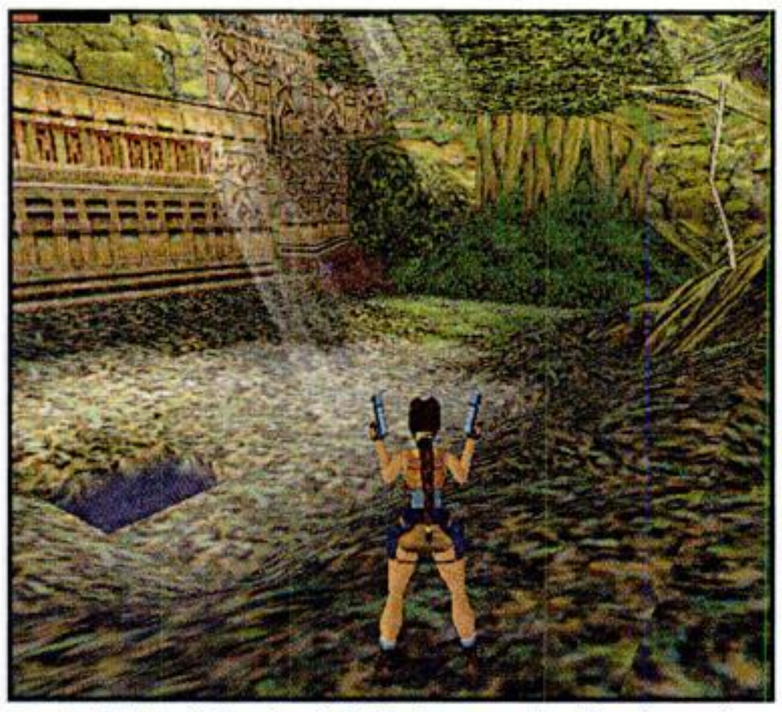
# Tomb Raider 3

The sophisticated, busty heroine of the indomitable *Tomb Raider* series returns in a cavalcade of new environments, new vehicles, and new skivvies. The third *Tomb Raider* sports Lara in her usual scanty garb, traversing the globe in search of ancient civilizations. Driving this cash cow once again, Eidos and Core have forgotten what made the original such a success: innovative gameplay.



**Tomb Raider 3 is chock-full of expansive levels and hackneyed gameplay.**

One of the biggest faults of the *Tomb Raider* series has always been its crummy engine. Graphical glitches, such as horrible clipping problems, camera inconsistencies, and control issues, continue to plague *Tomb Raider 3*, showing that less attention was paid to the infuriating original problems and more paid to Lara's clothes. Supporting Direct3D resolutions up to 1024x768, *Tomb Raider 3* keeps up with the times, but shows signs of age. Sprite-based plant life and paper-thin fish are just laughable in this day and age. Furthermore, inane puzzles that require precision timing are aggravating because Lara is frustratingly slow to respond to keyboard commands. Be prepared to replay many sequences over and over and over.

One saving grace for hardcore *Tomb Raider* fans is the sizes of the levels. They're massive. With 19 levels spread across five different locations, there's hours of gameplay to dig into, though tedious gameplay at best.

This perennial third-person shooter is in desperate need of a major overhaul. *Tomb Raider 3* delivers little more than the same run-down gameplay the previous titles hashed out. New costumes? Woohoo. Let's hope the Barbie Fashion Show stops and some real enhancements are added to the inevitable sequel.

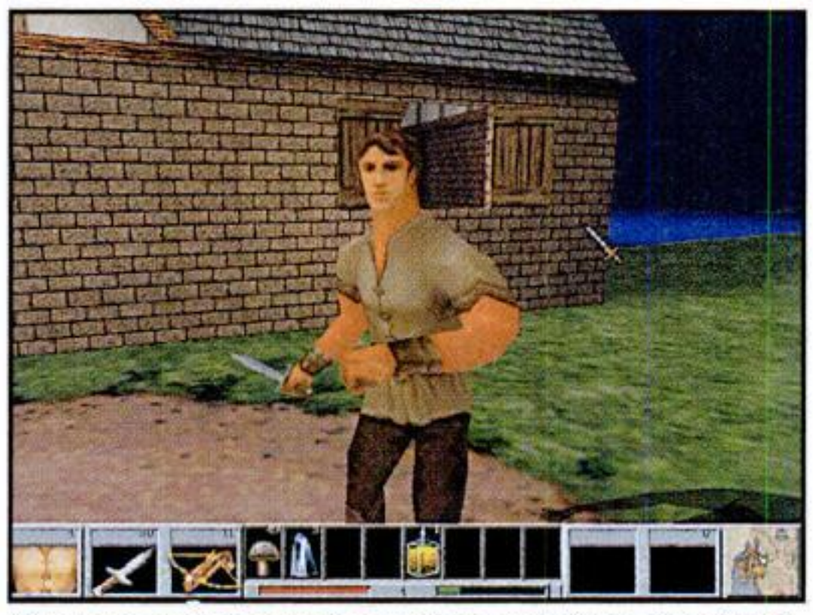
**MAXIMUM PC VERDICT**

**Price** $40
**Company** Eidos
**Phone** 214.953.0101
**URL** www.eidos.com

**3**

# Kings Quest: Mask of Eternity

In Sierra's latest *Kings Quest* epic, you play a chinless Patrick Stewart-sounding commoner named Connor who must piece together the broken Mask of Eternity—a none-too-easy quest that has you traveling across the world and into other-worldly dimensions. While the *Kings Quest* series has been hailed as one of the greatest adventure series of all time, this latest installment adds little to the lineage. There's just not a whole lot going on this time around.



**Connor would be an OK guy if he weren't such a choad.**

A hybrid mix of role-playing, adventure, and puzzle game, *Mask of Eternity* boasts some incredibly expansive levels with plenty of room to uncover hidden items. Too bad the environment is thin and inauthentic. Polygon pop-up is prevalent everywhere, signs and roofs instantly appear from the blue and green fog pervades the land of Daventry. Supporting both Direct3D and Glide, *Mask of Eternity* runs admirably at 800x600, but you can't bump up the res any higher. Most characters are composed of only 350 polygons, giving them a flat, insubstantial feel. Tepid graphics only hurt the tired storyline. Yet another epic fantasy quest to save the world from the forces of darkness. Yawn.

Though the graphics might be forgivably poor, the real problem with *Mask of Eternity* is the atrocious control. The camera implementation is extremely awkward, with separate controls for moving Connor and controlling the camera. If you have a weapon drawn and want to look up, you have to hit Ctrl-Shift-Rclick-pull mouse down. Ugh. Thank goodness for the first-person view.

*Mask of Eternity* could have been a lot better. The story is tired, the landscape flat, and the puzzles uninteresting. Sierra had the right idea, by creating a fully 3D adventuring environment, but there are enough ergonomic nightmares here to scare away even the most die-hard *Kings Quest* fan.

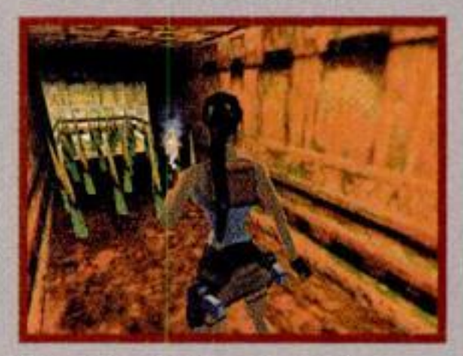
**MAXIMUM PC VERDICT**

**Price** $50
**Company** Sierra
**Phone** 425.649.9800
**URL** www.sierra.com

**4**

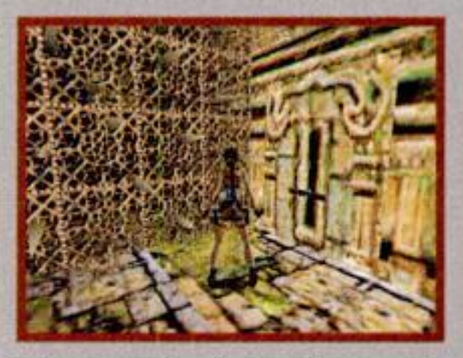
## SURVIVING LARA'S INDIA

One of the keys to surviving the India of *Tomb Raider 3* is learning the difference between merely dangerous and hopelessly fatal. One of the best ways to circumvent the frustration of multiple deaths is to know what to expect from each level.



**This fiendish trap is just waiting for a hapless victim.**

- **Never trust a lever** More often than not, levers not only open a door, but also release one of many traps designed to squash or impale poor Lara. It's up to you to run like hell whenever you pull one. Find an alcove, nook, or cranny to hide in until the rumbling stops. If you're lucky, you won't get squashed from behind.
- **Watch the corners** Level designers have a bad habit of placing enemies just out of sight as you're turning a corner. This cheap trick is more than aggravating. Always have a weapon drawn!



**Watch out for that spikey wall!**

- **Monkeys steal medkits** The poor helpless baboons have a bad tendency to run off with medkits. It's usually in your best interest to waste 'em anyway. They're harmless to you, but you gotta remind them who made it to the top of the food chain.
- **Beware of Quicksand!** Quicksand looks just like dirt. If the floor is rippling, it's probably quicksand. Find another way around.



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### ULTRA2 LVD SCSI

Ultra2 doubles the total bus throughput of Ultra Wide SCSI (40MB/sec) to 80MB/sec by increasing the clock rate to 40MHz.

A new type of transceiver, which dictates cable length and total number of devices supported, is also used. The most popular SCSI transceiver up to this point has been Single-Ended (SE) Signaling, which offers a bus length of 3 meters. It also generates a lot of line noise. High Voltage Differential (HVD) Signaling offers bus lengths up to 25 meters, although it is not electrically compatible with SE, meaning it can't control slower devices such as tape backup drives and CD/DVD-ROM devices.

Ultra2 SCSI utilizes a new transceiver technology called Low Voltage Differential (LVD) Signaling, which draws dramatically less power, has a bus length of 12 meters, and is backward compatible with older SCSI devices of every flavor. And although Ultra2 hard drives work fine on Ultra Wide controllers, we've found that burst rates using non-Ultra2 cables and terminators are reduced dramatically (from 45MB/sec to 60MB/sec down to less than 20MB/sec).

LVD also consumes less power, offers better transmission reliability for stronger connections and data integrity, and can connect up to 15 devices without creating a bottleneck.

# Ultra2 SCSI Hard Drives

## They put Ultra DMA to shame

Ultra SCSI reigns over IDE with its fat data bus because it's backed by features that include Multi-Threading, Command Tag Queuing, and Connect/Disconnect. But maybe the best reason is the 10,000RPM spindle rate that high-end SCSI drives like these can attain.

For those who still think Ultra DMA is on par with SCSI, we're here to set the record straight. We took the fastest Ultra DMA drive (the IBM DeskStar 14GXP) and put it under the Iometer benchmark in Windows NT. Ultra DMA drives delivered random access scores that were at least 35% below the best Ultra2 drive tested here. The maximum number of I/O cycles was roughly the same, while data throughput scores were 7MB/sec slower on average. The maximum burst of Ultra DMA is limited by the 33MB/sec bus (the DeskStar filled 27MB/sec of that adequately). That's nowhere near the 58MB/sec bursts we saw with the Ultra2 drives. And from what we've already heard, we don't expect to see the next generation of Ultra DMA drives coming close to the these types of burst rates, not even with a 66MB/sec bus.

Don't be scared of SCSI. It's not that tough to configure, and the payoff is worth the effort. We've pummeled these drives with a full artillery of benchmarks to show you why we think Ultra2 SCSI is the power user's dream. And you'll also be surprised just how affordable these drives have become.

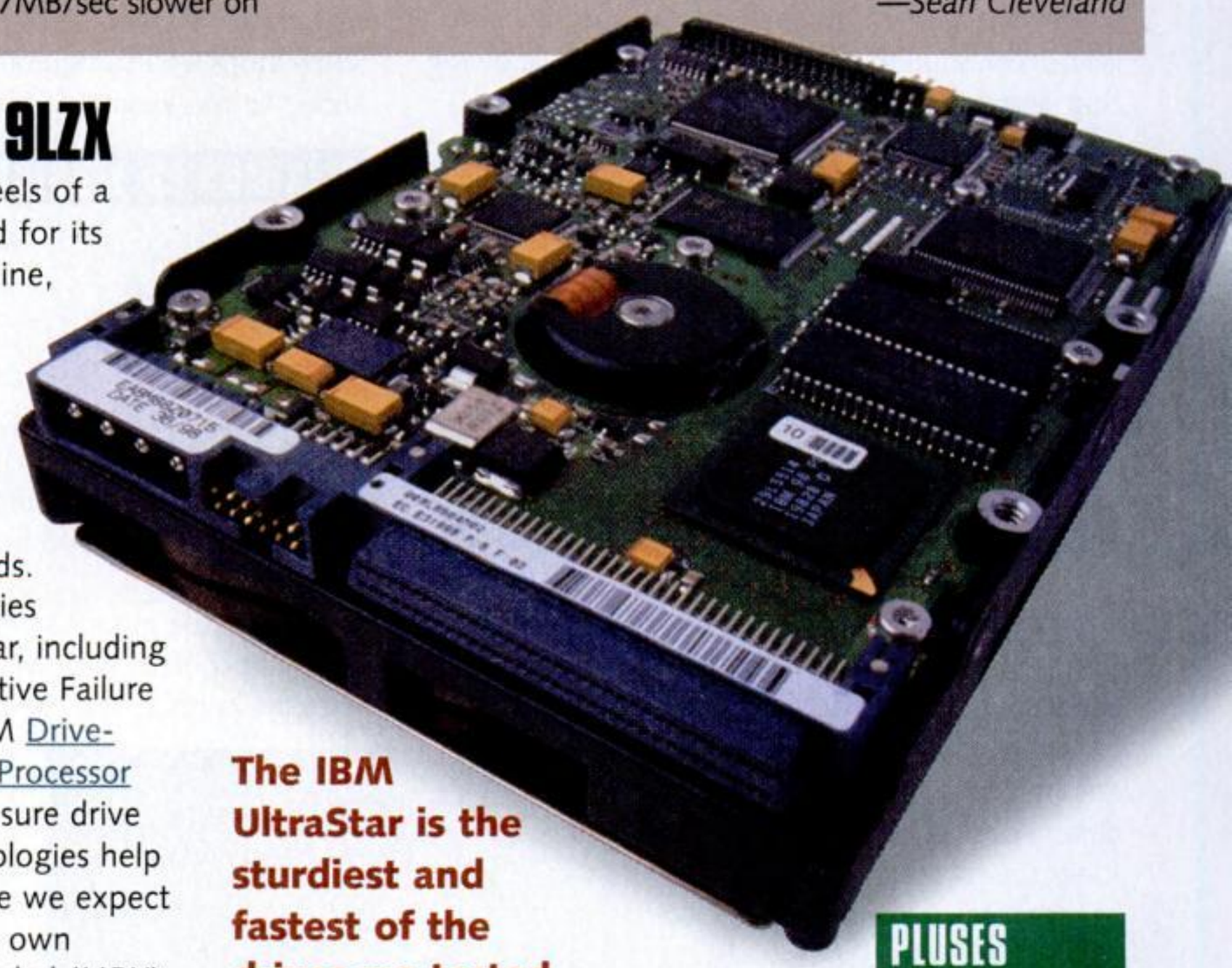
*—Sean Cleveland*

## IBM UltraStar 9LZX

MAXIMUM PC KICK ASS! product

IBM, on the heels of a Kick Ass award for its IDE DeskStar line, has again proven the superiority of its storage division by delivering a drive worthy of the SCSI gods.

A slew of technologies encompass the UltraStar, including S.M.A.R.T., IBM Predictive Failure Analysis (PFA), and IBM Drive-Temperature Indicator Processor (Drive-TIP). All help ensure drive reliability. Other technologies help deliver the performance we expect from IBM, including its own Magnetoresistive Extended (MRX) head technology, No-ID sector formatting, and a custom controller with hardware-assist functions. All of these technologies combined helped IBM build a drive that requires fewer discs and heads, resulting in a high level of performance.



**The IBM UltraStar is the sturdiest and fastest of the drives we tested.**

Under the stopwatch, the UltraStar was awe-inspiring, setting new performance records, and earning our respect—and a Kick Ass award to boot. Whether bursting at speeds of 58MB/sec, sprinting with random access times under 8.5ms, or speeding at 18MB/sec, it was a beauty to behold. We can only fault its CPU utilization scores, which were more than 5% above the rest.

Combining highly engineered internals and delivering on performance benchmarks, the UltraStar lives up to its name. Ultra2 SCSI made this drive possible, and even though our power-hungry appetites continue to grow, IBM's first-generation model has left us more than satisfied.

**THE SPECS**

| | |
|---|---|
| BUFFER SIZE | 4MB |
| NUMBER OF DISCS/HEADS | 5/10 |
| TOTAL/FORMATTED (FAT32) CAPACITY | 9.1GB/8.53GB |
| ROTATION SPEED | 10,020RPM |

**PLUSES**
- Highest throughput
- Great AV performance
- Solid construction

**MINUSES**
- Higher than expected CPU utilization

**MAXIMUM PC VERDICT**

**Price** $625
**Company** IBM
**Phone** 888.426.5214
**URL** www.storage.ibm.com

9

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.

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## Seagate Cheetah 9LP

The first-gen Cheetahs had severe heat problems, requiring dedicated cooling. Seagate reduced the platter size, thus decreasing power consumption and the distance the head travels on the platter. The result was a new Cheetah that runs 40% cooler and shows increased performance.

The Cheetah also benefits from other technological improvements, including magnetoresistive heads, a PRML channel, and Seagate's own ultra-high-performance embedded servo. But this animal just can't keep up with the star-shooting speed of the UltraStar. The Cheetah can sprint, especially in Win98, where CPU utilization scores were the lowest of these drives. Under our benchmarks, we found that small data packets were handled with finesse, resulting in random access times and database-like performance second-to-none. Also, the Cheetah deftly handled the drive-thrashing Threadmark benchmark, beating out the other drives by a whopping 900K/sec. This proves its ability to find data, no matter how fragmented.

We noticed detection problems by the Ultra2 bus at bootup, which we weren't able to pinpoint the cause of. Repowering the machine usually resulted in success. Also, the Cheetah growls—really. But once it's running, it works hard.

The Seagate Cheetah can sprint, although top-end speeds fall short.

**THE SPECS**

| | |
|---|---|
| BUFFER SIZE | 1MB |
| NUMBER OF DISCS/HEADS | 6/12 |
| TOTAL/FORMATTED (FAT32) CAPACITY | 9.1GB/8.45GB |
| ROTATION SPEED | 10,000RPM |

**PLUSES**
- Good real-world benchmarks
- Great random access scores
- Solid construction

**MINUSES**
- Poor A/V performance
- Low burst scores

**MAXIMUM PC VERDICT**

**8**

**Price** $650
**Company** Seagate
**Phone** 800.732.4283
**URL** www.seagate.com

## Western Digital Enterprise WDE9100AV

Western Digital assured us the Enterprise would compete with the other drives tested here. Its aggressive disk caching algorithms, large 4MB internal buffer, second-gen headerless embedded servo, magnetoresistive head technology, and fifth-gen PRML channel should have been enough. Unfortunately, this was not the case.

The Enterprise finished last on benchmarks that test mechanical speed, such as HD Tach and the Iometer maximum-throughput test. The 7,200RPM spindle speed caused the drive to fall short, and its excellent caching was moot, since these benchmarks ignore caching. Despite this, the Enterprise was able to burst the most data across the bus and peaked at 56MB/sec in Win98 and almost 59MB/sec in NT. It also sucked the least power from the CPU. The Iometer random and I/O tests also revealed that the Enterprise suffers from high random access times and a lower than expected I/O rate.

Real-world benchmarks showed off the Enterprise's caching capabilities spectacularly, and it fell behind the other drives' times by mere seconds. Taking away system memory is like a stake in the heart, though, as shown by the benchmark that launches apps with only 32MB of memory. The time to copy 650MB was simply incredible in NT, as it delivered a score that was almost 20 seconds faster than the Cheetah and UltraStar.

In the end, the Enterprise performed on par with another drive we benchmarked recently—the IBM DeskStar.

The Enterprise doesn't have the solid **workmanship** of the others, **but its** performance **tuning helped** it **keep up.**

**PLUSES**
- The highest burst scores
- Low CPU utilization
- Good cache scheme

**MINUSES**
- Low-quality construction
- Poor throughput scores
- No 10,000RPM version

**MAXIMUM PC VERDICT**

**6**

**Price** $575
**Company** Western Digital
**Phone** 800.832.4778
**URL** www.westerndigital.com

**THE SPECS**

| | |
|---|---|
| BUFFER SIZE | 4MB |
| NUMBER OF DISCS/HEADS | 6/12 |
| TOTAL/FORMATTED (FAT32) CAPACITY | 9.1GB/8.53GB |
| ROTATION SPEED | 7,200RPM |

**DARE TO COMPARE**

| DRIVE | ULTRASTAR 9LZX | | CHEETAH 9LP | | ENTERPRISE 9100AV | |
|---|---|---|---|---|---|---|
| OPERATING SYSTEM | WIN 98 | NT 4.0 | WIN 98 | NT 4.0 | WIN 98 | NT 4.0 |
| **HD TACH BENCHMARKS** | | | | | | |
| Average read speed (MB/sec) | 18.5 | 18.2 | 15.9 | 15.7 | 11.9 | 11.6 |
| Average write speed (MB/sec) | 14.9 | 14.6 | 13.3 | 13.1 | 9.6 | 9.5 |
| Random access time (ms) | 8.5 | 8.7 | 8.4 | 8.8 | 11.8 | 12.0 |
| Read burst speed (MB/sec) | 55.2 | 57.5 | 43.2 | 44.6 | 56.2 | 58.6 |
| CPU utilization (%) | 15.6 | 14.2 | 8.9 | 10.8 | 10.3 | 8.5 |
| **INTEL IOMETER** | | | | | | |
| Random access test[1] (tps) | - | 104.4 | - | 109.8 | - | 78 |
| Max. read throughput[2] (MB/sec) | - | 19.4 | - | 18 | - | 13.5 |
| Max read I/O rate[3] (IOps) | - | 38.7 | - | 36.1 | - | 27 |
| **ADAPTEC THREADMARK** | | | | | | |
| Data transfer rate (MB/sec) | 6.5 | 12.2 | 6.5 | 13 | 6.4 | 11.1 |
| Average CPU utilization (%) | 44 | 13.9 | 41.2 | 14.2 | 37.1 | 12.9 |
| **REAL-WORLD BENCHMARKS** | | | | | | |
| Time to boot OS (sec) | 15 | 20 | 14 | 20 | 20 | 22 |
| Time to launch apps[4] (sec) | 36 | 19 | 38 | 20 | 40 | 27 |
| Time to copy 650MB[5] (min) | 2:51 | 3:09 | 2:32 | 3:08 | 3:22 | 2:53 |

Drives tested using an Adaptec 2940U2W Ultra2 SCSI card. [1]Performs 2K random reads (67%) and writes (33%) across the whole drive, which represents a typical database workload. Score reported is in Transactions Per Second (see Terminator). [2]Performs 64K sequential reads across the whole drive delivering a maximum throughput rate in MB per second. [3]Determines maximum number of Inputs/Outputs (I/Os) per second by reading 512K blocks of data sequentially across the whole drive. [4]Tests the time it takes to launch Adobe *Photoshop*, MS *Access*, MS *Excel*, MS *Outlook*, MS *Powerpoint*, and MS *Word*. [5]The contents of Maximum CD 04 were copied to another folder on the same drive.



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# BIOs ▶ meet the writers behind Maximum PC

**Nels Johnson** is President of Download Recordings, a San Francisco Bay Area consulting and production firm specializing in desktop video and multimedia software development. He is the author of *How to Digitize Video* (John Wiley, 1994), *Web Developer's Guide to Multimedia and Video* (Coriolis, 1996), and *Web Developer's Guide to Multicasting* (Coriolis, 1997).

**Dan Simpson** lives in sunny California, biding his time in Santa Cruz as a technical writer in the dungeons of a big UNIX company. With clay tablets, a hammer, and a chisel, he carves out documentation, release notes, and other sundry items few people read. He's owned and fried more than his fair share of hardware, but reminisces mostly about his beloved Commodore 64. His current addictions include *Starcraft*, theforce.net, and making silly web pages. When not in front of a computer, he listens to strange music and watches bad movies.

**Linda Lee** is a San Francisco-based high-tech writer and editor for the graphic arts and computer industries. Formerly a senior editor at *Digital Production Executive* and *Desktop Publishers Journal*, Linda currently develops computer books within Sybex Inc.'s Network Press.



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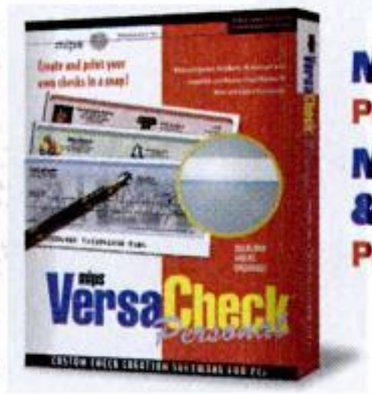

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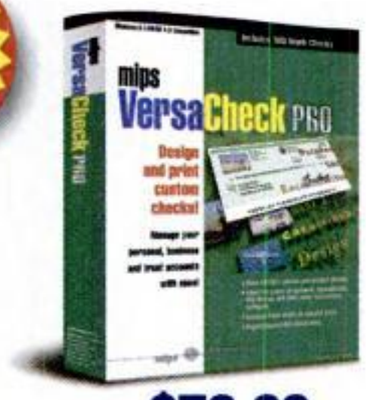

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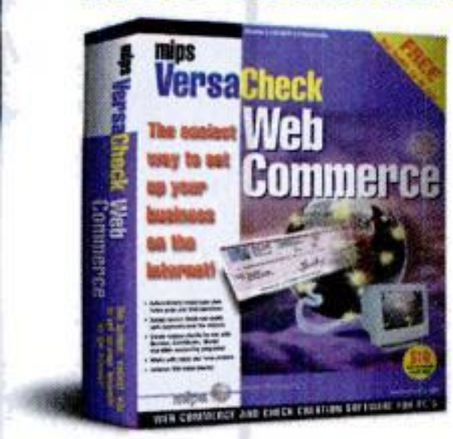

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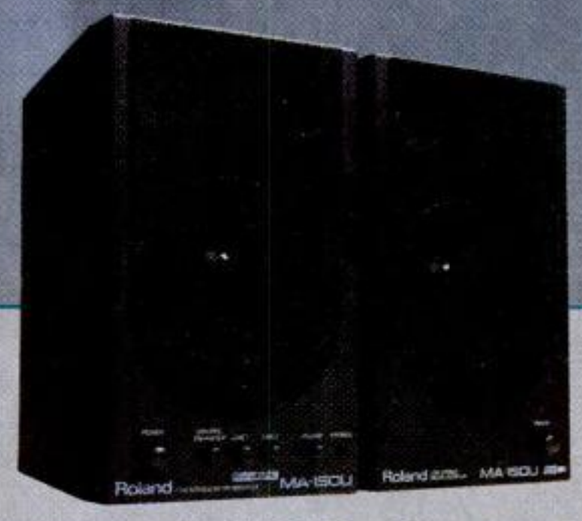


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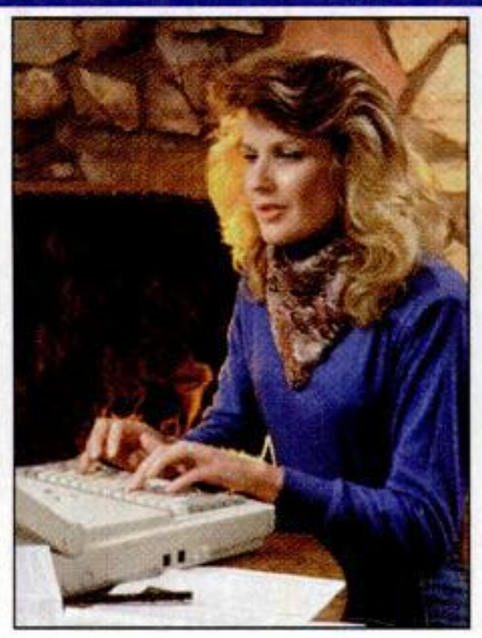

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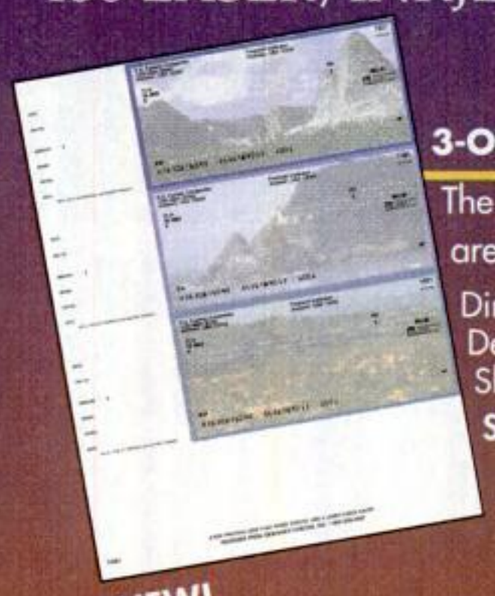

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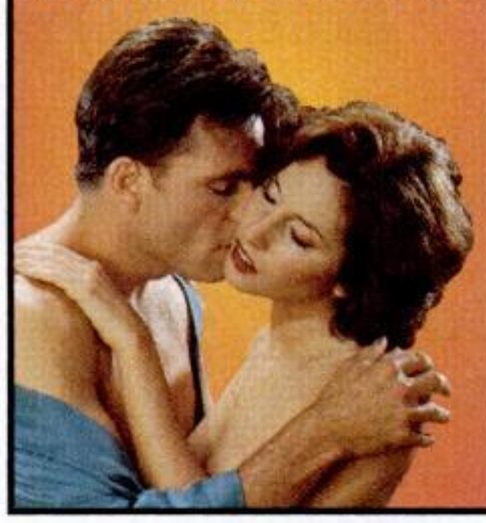

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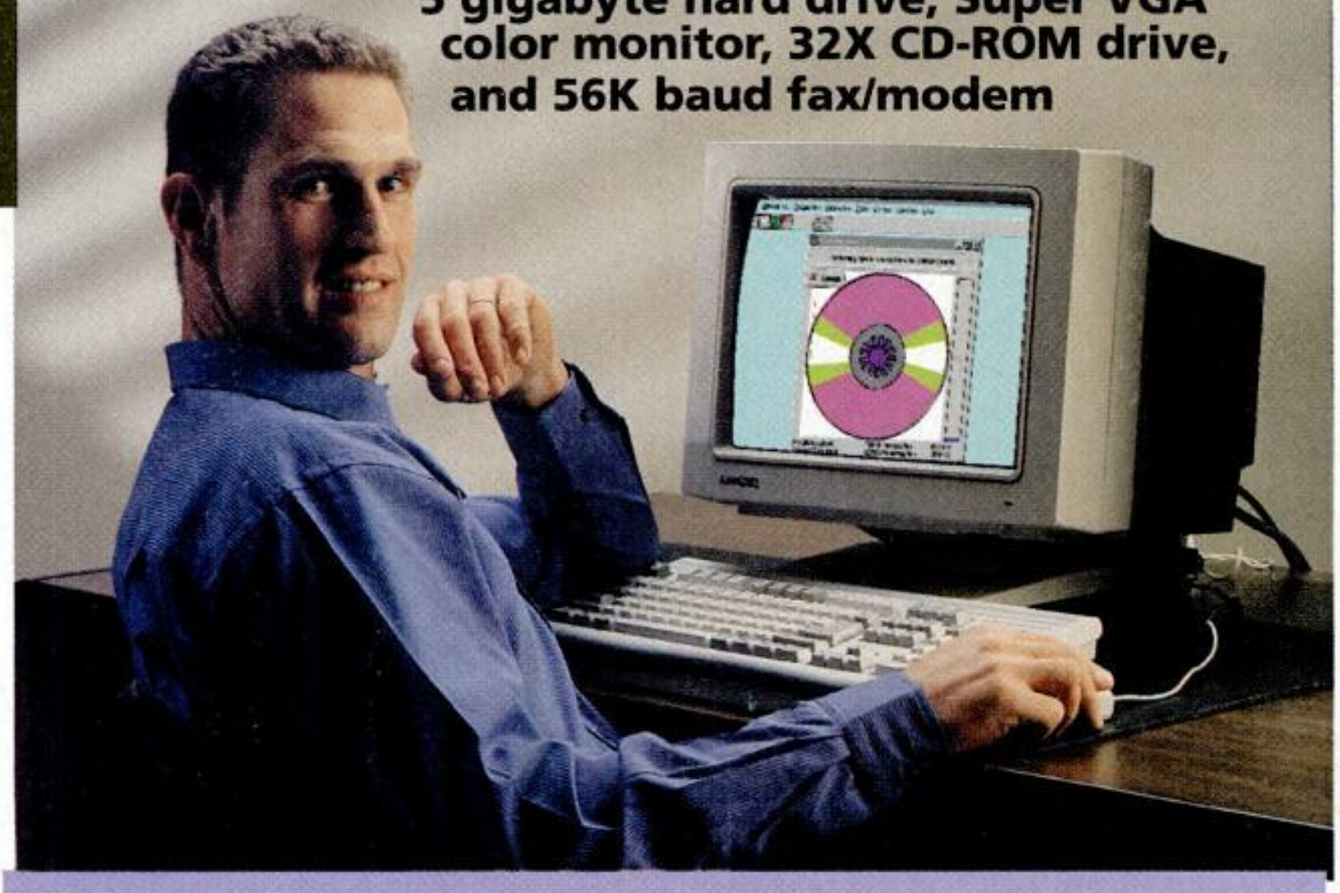

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# TERMINATOR

## Tech Terms Revealed ▶

Technical terms found throughout MAXIMUM PC are underlined and in blue. Hyperlink back to here for revelation and further explanation. Terms appearing in **blue** within the Terminator are updated definitions of previously explained concepts. The extended Terminator (with terms not found in this issue of the magazine) is also found online at **www.maximumpc.com**.

### A

**A3D** See Aureal3D

**Accelerated Graphics Port** AGP is an expansion bus developed by Intel specifically for the videocard subsystem. It operates independent of the PCI bus and normally runs at 66MHz (i.e., 1x). Whenever you see multipliers attached to AGP, such as 2x or 4x, they are referring to how much faster the bus will run—2x means 66MHz x 2, or 133MHz.

**AC-3** Also Dolby Digital 5.1. AC-3 is a method of encoding sound to five discrete or separate channels: front left and right, front center, and rear left and right.

**actuator assembly** The heads detect magnetic transitions, or the data from a disk. The assembly is the motion to move the heads across the disk

**AGP** see Accelerated Graphics Port

**APC** Armored Personnel Carrier

**ATA-66** An enhanced version of the IDE I/O interface that supports 66MB/sec.

**ATX** A motherboard formfactor that's smaller than AT, it's a standard configuration definition for most modern full-size desktop and tower PCs. Subsets of this include NLX, LPX, and MicroATX. There are numerous differences between the older Baby AT formfactor and ATX, including relocation of the CPU to an area closer to the power supply fan and concentration of I/O ports in one rectangular cluster. How do you know which one you have? Generally, an ATX-type machine will turn itself off after selecting shut down in Windows 95 or NT.

**Aureal3D** A proprietary API for handling 3D positional sounds and Doppler effects. Using algorithms developed for NASA, A3D is able to simulate 3D positional sounds on two speakers. A3D will support four or more speakers, but is optimized for two.

### B

**backward compatible** Referring to a device that will work with earlier models (hardware) or versions (software) of the same product.

### C

**CAV** see Constant Angular Velocity

**CCD** Charge Coupled Device. Found in digital cameras and scanners. CCDs convert light in our analog world into digital data.

**CD-RW** Short for CD-ReWritable, an optical storage technology that allows you to erase and record the data on a CD. In comparison, CD-Recordable allows you to write data only once.

**CHS IDE Mode Type** CHS (Cylinders, Heads, Sectors-per-track) translations used to bypass the limits imposed by the OS. The parameters used to determine the capacity of a hard drive. They are the actual number of cylinders, heads, and sectors per track on the drive platters.

**CIS** see Contact Image Sensor.

**client** A single-user computer attached to a network. Clients are usually desktop PCs but can also include laptop computers and even hand-held devices. Clients can access servers and sometimes other clients over the network.

**cluster** Also called "allocation units," a cluster is the number of sectors that the OS allocates each time disk space is needed. For example, if the cluster size is 16 (thirty-two, 512B sectors per cluster), then every file will use 16K even though the actual file size may be less. So a small file that was only 1K would actually take up 16K.

**CLV** see Constant Linear Velocity

**Command Tag Queuing** A feature of the SCSI-2 protocol that allows device controllers to accept and queue multiple commands from multiple host processes without waiting for a pending I/O request to be completed, resulting in a more efficiently utilized SCSI bus. Basically, it allows devices to immediately accept and execute other commands while data that has already been read or written is sent back up the bus to the SCSI host adapter. It also allows the device controller to execute commands in a different order than they may have been received from the host adapter. Performance improves significantly when a device is optimized to execute commands in a more intelligent order.

**Connect/Disconnect** Allows multiple connected drives to share the SCSI bus bandwidth by allowing them to disconnect individually from the SCSI bus when other drives/devices have information to send.

**Constant Angular Velocity** CAV CD-ROM drives spin the disc at a constant speed, so the data rate increases as the pickup moves to the outer edges of the disc. Constant motor speed eliminates the need for settling of the optical pickup after seeking data, resulting in an improved access rate. CAV-based drives are simpler to design and produce because the motor doesn't need to change speed.

**Constant Linear Velocity** CLV drives vary the speed the disc is spinning at so that the data rate of the drive is constant. The drive rotates the disc faster when reading the inside tracks and slower when reading the outside tracks as more data is pumped through the head. This is to ensure a constant data rate regardless of where on the disc it's being accessed. CLV-based drives generally encounter latency at high-speeds when the rotational speed needs to be changed.

**Contact Image Sensor** A low-cost and lower-profile scan head based on LED technology.

**crash stop** Soft plastic material that the heads hit, rather than hitting metal.

**coverage** The area of a printed page covered with ink.

### D

**dial-up connection** A connection to a remote network (such as the Internet) through an analog modem over an ordinary telephone line. It's a slower and less convenient connection than a direct digital hookup, such as an ISDN, ADSL, or cable modem.

**die** The actual square piece of silicon that contains integrated circuits.

**Direct3D** A subset of Microsoft's DirectX Application Program Interface. This interface allows developers to use hardware acceleration for 3D graphics, which helps games run faster by offloading the 3D processing onto a dedicated piece of hardware.

**Disc-at-Once** A method of writing CDs where one or more tracks are written in a single operation without turning off the laser.

**disk cache** Memory located internally on a hard drive that's used to bridge data between the drive and the interface. This cache memory is much faster than the mechanical drive and is used to store data that has been previously read. So when data is requested, the cache is checked first before checking the actual drive.

**drive head** see heads

**DSL** Digital Subscriber Line. A broadband Internet technology that wrings fast-speed access from regular, old telephone lines.

**DSP** Digital Signal Processor. A specialized processing unit generally used to perform just a few functions but at incredible speeds. DSPs are often found in cellular phones, fax machines, or soundcards. Digital Signal Processing is often used to denote conversion of an analog signal to digital. It is more commonly referred to in soundcards for processing of sound.



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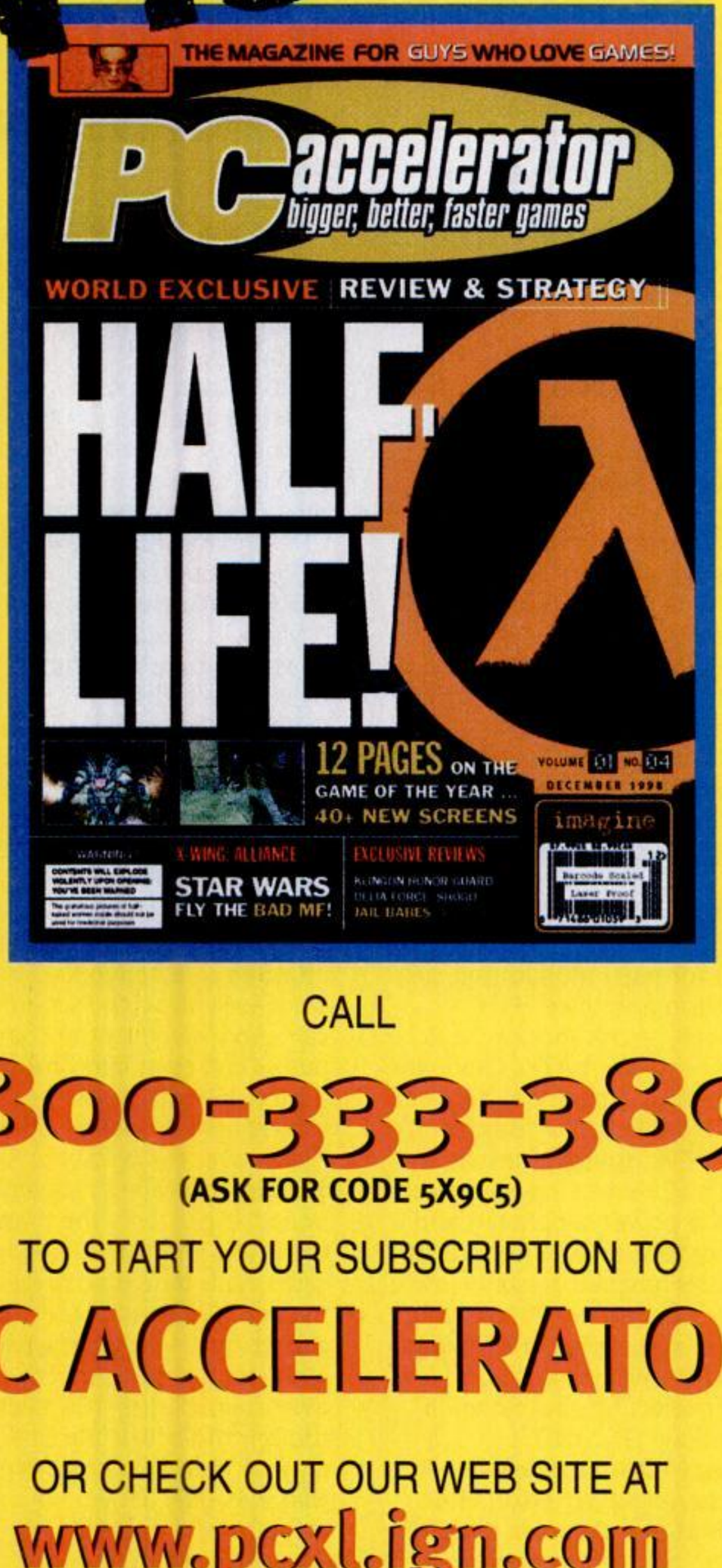


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## E

**Enhanced Adaptive Battery Life Extender** An IBM technology that dynamically selects the appropriate power-management idle mode when the disk drive is idle to minimize power usage and help preserve battery life. The idle-mode selection is based on the disk drive access patterns of the machine so disk response times can be significantly improved.

**electromigration** The combination of heat and electric fields in a CPU can cause the metal atoms to wander off connectors and wreak havoc. The connectors grow "little whiskers" at sharp corners that can grow toward each other and eventually short circuit the chip.

## F

**FAT** A DOS- and Windows-based file system that tracks the location of data on a disk using File Allocation Tables (FAT), which are simply tables of numbers that indicate the status of a cluster or the location of the cluster belonging to a file. A directory table is used to track file names, extensions, date, and other info, including where the FAT address of where the file starts. When a file is requested, the table is checked, and the cluster containing the file is located. The address of the next cluster is also located if the file is larger than a single cluster until an END OF FILE designator has been reached. A FAT entry of 0 indicates that the cluster is free to be written to. DOS actually writes two FATs to a logical volume where the second is used to replace the primary in case it becomes damaged.

**FAT16** A 16-bit DOS and Windows file system (see FAT) that varies cluster sizes based on hard drive size. Cluster sizes range from 4K (for drives up to 127MB), to 4K (255MB drives), 8K (511MB drives), 16K (1GB drives). and 32K (for drives up to 2GB). The ultimate capacity of a FAT16 partition is 2GB.

**FAT32** A 32-bit file system that was introduced with Windows 95 OSR2 that uses 4K cluster sizes for all drive sizes with a maximum capacity of 8GB.

**floating-point** A fractional number, such as 9.95 or 98.6. Computers have a more difficult time working with floating-point numbers than they do with integers (whole numbers), but the higher precision of floating point is required for some operations.

**frontside bus** The main system input/output (I/O) interface that connects a microprocessor to other system devices. Typically, it allows the processor to communicate with main memory (RAM), the system chipset, PCI devices, the AGP card, and other peripheral buses. It also connects to the Level 2 cache unless the processor has a backside bus.

## G

**Giant Magnetoresistive Heads (GMR)** GMR is an advancement over the previous magnetoresistive (MR) head in that GMR heads have a greater sensitivity to magnetic fields from the disk. This makes it possible to detect smaller recorded bits and to read those bits at higher data rates. The larger signals also help overcome the electronic noise that plagued older drives.

## H

**heads** The mechanism that reads/write data to/from a magnetic disk or tape. If the head is damaged or dirty, the drive won't read the media properly.

**headsets** With respect to technologies such as 1.44MB floppy disk and 100MB Zip disk, multiple magnetic heads for reading different formats.

**High Voltage Differential (HVD) Signaling** Where signals are sent on two wires with the data represented as the difference in voltage between the wires.

## I

**IBM Drive-Temperature Indicator Processor (Drive-TIP)** An IBM technology that automatically monitors disk drive temperature and alerts the SCSI drive controller when the recommended temperature is exceeded.

**integer** A whole number, such as 1, 2, 3, etc. Computers can manipulate integers much faster and more accurately than they can manipulate floating-point numbers (fractions), but integers aren't precise enough for some operations.

**ISO 9660** A specification defined by the ISO standards organization that outlines how a CD-ROM directory format is to be laid out and read between different computer systems. A disc that is written to the ISO 9660 specification will read on any ISO 9660–compliant drive.

## L

**L2 cache** A high-speed bridge between the CPU and main system memory. Because the CPU runs faster than the memory bus—say 400MHz versus 100MHz—cache becomes useful to temporarily store instructions and data, making sure the CPU has a steady supply of material to churn while memory catches up.

**LAN** see Local Area Network

**Large IDE Mode Type** Uses the CHS translation for drives over 1,024 cylinders but without LBA support. It's often referred to as Extended CHS and is better for performance (but not compatibility).

**LBA IDE Mode Type** LBA (Logical Block Addressing) is an alternative disk-accessing method that uses a logical address number instead of CHS info. Both the drive and BIOS must support LBA, as the BIOS translates the CHS parameters from the drive during initialization. The OS and the drive then communicate via LBA.

**linear actuator** A unique way to move the heads on a disk drive. The heads move linear to the disks. It is used for Iomega's Zip products. See rotary actuator.

**load ramp** Keeps the heads apart when a disk isn't in the unit. It also allows you to load the heads as well.

**Load/Unload Technology** A mechanism developed by IBM that allows the read/write head on a hard disk to rest on a ramp when it is not reading and writing data on the disk. This prevents the heads from sliding over the smooth disk surface during starting and stopping of the disks when the disks are rotating at less than full speed and then sticking to the drive (which happens easily between two very smooth surfaces). Previously, the disk had to be textured to prevent this, but it became difficult to do with higher capacity hard disks.

**Local Area Network** A private computer network within a building or a local group of buildings. Most LANs are wired with cables hidden in walls and ceilings, although wireless connections are also available.

**locking on** A latch that holds the actuator assembly in place.

## M

**magnetoresistive heads** Magnetoresistive heads use a separate read and write elements for optimized read and write capabilities. The read element is composed of a thin-film material whose resistance changes when near a magnetic field. This in turn produces a stronger signal that allows for greater areal densities and larger disk capacities.

**Magnetoresistive Extended** IBM's fifth generation of MR head design allows for a smaller areal density (number of bits per square inch) of up to 3Gbits/inch$^2$. The MRX head is no bigger than the head of a pin and incorporates new technologies that allow it to send out stronger signals than older heads, allowing it to read and write larger volumes of info.

**MPEG-2** Moving Picture Experts Group. The name of a family of standards used for coding audio-visual information (movies, video, and music) in a digitally compressed format. MPEG-2 was designed to produce higher-quality images at higher bit rates (3Mbps to 10Mbps). It delivers true broadcast-quality video at a resolution of 720x486. It's also the standard specified for DVD. MPEG-2 supports AC3 Dolby Digital audio with surround sound, providing up to six separate channels.

**multiread** CD-ROM and DVD-ROM drives adhering to this specification can read commercial CDs (both data and audio), gold CD-R discs, and rewritable CD-RW discs (with both fixed- or variable-packets).

**multithreading** The simultaneous accessing of data by more than one SCSI device. This increases data transfer rates.

## N

**No-ID sector formatting** A hard drive technology from IBM that allows disk drives to be formatted more efficiently, improving the capacity, reliability, and performance. It works by storing the ID (or header) information in solid-state memory instead of on the disk surface. This increases the capacity of each track without impacting the linear density. It also dramatically increases track density when combined with a magnetoresistive head.

**Normal IDE Mode Type** Translation is mapped through the BIOS. This translation is only good for drives below the 528MB range due to its inability to address settings above 1,024 cylinders, 16 heads, and 63 sectors per track.

## O

**OCR** Optical Character Recognition. Generally refers to



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converting data from a scanned image into text. Different algorithms for recognizing characters offer more accurate recognition.

**OEM** Original Equipment Manufacturer. Companies that take raw components and make a final product for consumers to buy. It usually refers to the company that'll make the part you buy. For example, Diamond Multimedia and STB are OEMs who make videocards based on technology bought from chip makers.

**one-trick pony** The world's first circus, the Cuffling Cousins Circus, made its first appearance under the Big Top in the mid-1800s. Sadly, the circus only lasted for one performance because the only act they had—in addition to 100 clowns stuffing themselves into a cute little covered wagon—was a pony. The pony wasn't well trained or particulary smart, and could only do one trick playing dead. Unfortunately, the pony wasn't a big hit with the crowd, which then rioted, demanding its money back. Since then, the term "one-trick pony" has referred to something, or someone, who has only one discernable trait or notable characteristic.

**OpenGL** Open Graphics Language. An easy-to-use (for programmers anyway) graphics API created by Silicon Graphics. It's generally accepted in the high-end workstation market. In the Windows 9X world, OpenGL plays David to Microsoft's Direct3D Goliath or vice versa. It's a Chevy versus Ford debate with both sides locked and loaded.

## P

**P6** A CPU architecture family, of which the Pentium Pro, Pentium II, Pentium III, Celeron, and Xeon processors are currently members. The P6 core debuted with the Pentium Pro in the first half of 1995. It is defined by a deep pipeline that addresses cache bottlenecks, closely coupled and on-die L2 cache, fixed-length instructions called "micro-ops," and out-of-order execution. For a detailed explanation of these terms, please see our CPU White Paper in the Re:Print section of **www.maximumpc.com**.

**parity checking** A way to verify the accuracy of data transmitted over the SCSI bus. One bit in the transfer is used to make the sum of all the 1 bits either odd or even (for odd or even parity). If the sum is not correct, an error message appears.

**PCL3** Hewlett-Packard's Printer Control Language is the most popular language used to communicate with printers.

**PRML channel** The Partial-Response, Maximum-Likelihood technique differentiates noise from a good signal by measuring the rate of change at various intervals of the rising waveform. It uses digital signal processing (DSP) to reconstruct data and increase the number of bits that can be recorded.

**processor mode** A particular operational state dictated by a processor's architecture. Operating systems must comply with the mode or risk failure.

## R

**RAID** A Redundant Array of Independent Disks allows multiple drives to be attached into a single volume for increased performance and fault tolerance. Disk striping, a method that interleaves bytes or groups of bytes across multiple drives allows more than one drive to be read and written to simultaneously, increasing the data rate by almost a multiple of the number of drives used. Fault tolerance uses the same method although the data is duplicated onto another drive (called mirroring). Parity calculates the data in two or more drives and stores the result onto a separate drive that is connected but not used by the system.

**RDRAM** Rambus Direct Random Access Memory. A new high-speed memory design that supports speeds of up to 600MHz.

**register** A small storage cell in a microprocessor that temporarily holds numbers used by a running program. Usually the registers are 16, 32, or 64 bits wide. Program instructions put values in the registers, perform operations on the values, and copy the results back to memory.

**rotary actuator** A more common way of moving the heads on a disk drive—the heads rotate in a 45-degree angle. It is used in Iomega's Clik or Jaz products. See linear actuator.

## S

**sectors** The basic unit of physical storage for hard drives. They are usually 512K in length and are defined with magnetic markings and an identification number.

**server** A computer that provides resources to client computers over a network. Usually a server stores applications and data files for access by clients. Some servers run large programs (such as database managers) and send results of queries to the clients. Web servers store web sites for access over the Internet.

**shell** A program designed to present an easier user interface than what the computer normally provides. A shell's interface is usually graphical, but not always. Typically, a shell makes it easier to run programs and access the computer's storage devices.

**single-ended (SE) signaling** The most popular SCSI signaling technology in which each signal is sent over a single wire with a second wire for ground.

**S.M.A.R.T.** Self-Monitoring Analysis and Reporting Technology monitors the hard drive for possible problems that may occur due to predictable failures using the parameters set by the drive manufacturer. Both the motherboard BIOS and drive itself must support S.M.A.R.T.

**Socket 7** The motherboard socket that receives the fifth-generation of CPUs from Intel, AMD, and Cyrix. All Pentium-level CPUs fit into Socket 7.

**SOHO** Small Office/Home Office. Marketing term for a category of products that serve people who work at home or have small businesses.

**solid-state memory** Silicon-based memory that doesn't rely on mechanical, moving parts

**spin down** When the hard drive spindle stops spinning and the point where you won't be able to read data. To read data, the hard drive spindle has to be spinning at its RPM rating.

**spin-up** When the hard drive spindle starts to spin in order for you to read data. For example, a 7,200RPM-rated hard drive's spindle would have to start rotating at that speed before you could actually access data.

**striping** see RAID

**Super 7** A refinement of the Socket 7 microprocessor interface, which attaches x86-compatible processors to system motherboards. Super 7 can run at 100MHz, or 50% faster than Socket 7's 66MHz. That makes it easier for system devices to keep up with the processor.

**system bus** The pipe that sends data back and forth between main memory and the CPU.

## T

**TFT** Thin Film Transistor. The essential component in any modern LCD notebook or flat-panel display.

**track-at-once** A method of writing CDs where the laser is stopped after every track (data or audio) has been written. This creates a gap between each two-to-three-second audio track.

**transaction rate testing** A "transaction" consists of a request (read or write) followed by a reply (write or read) of the same or different size piece of data.

**TrueTrack Servo technology** An IBM patented servo technology that overcomes head-track misalignment errors due to spindle vibrations and small shifts in the disk position, both a direct result of design limits at high track density on hard drives with high RPMs.

## V

**virtual filespace** The sum total of all mass storage devices accessible from a computer. For computers not attached to networks, the filespace consists of local devices only. Networked computers have access to remote servers (and sometimes other clients) on LANs, WANs, or the Internet.

**VPN** Virtual Private Network. A private computer network that spans large distances, up to global in scope. It's similar to a WAN, except it uses the public Internet for this purpose instead of private leased lines. VPN traffic is typically encrypted to prevent snooping.

## W

**WAN** Wide Area Network. A private computer network that spans large distances, up to global in scope. Usually a WAN connects LANs in multiple locations. A large company might use a WAN to unite the LANs in all of its offices. Some WANs use the public Internet for this purpose and are called VPNs (virtual private networks).

## Z

**Zoned Constant Linear Velocity (ZCLV)** Zoned Constant Linear Velocity separates a disc into zones. The spindle speed is then changed within each of the zones rather than uniformly across the entire disc. DVD-ROM discs usually contain around 24 zones. See Constant Linear Velocity.



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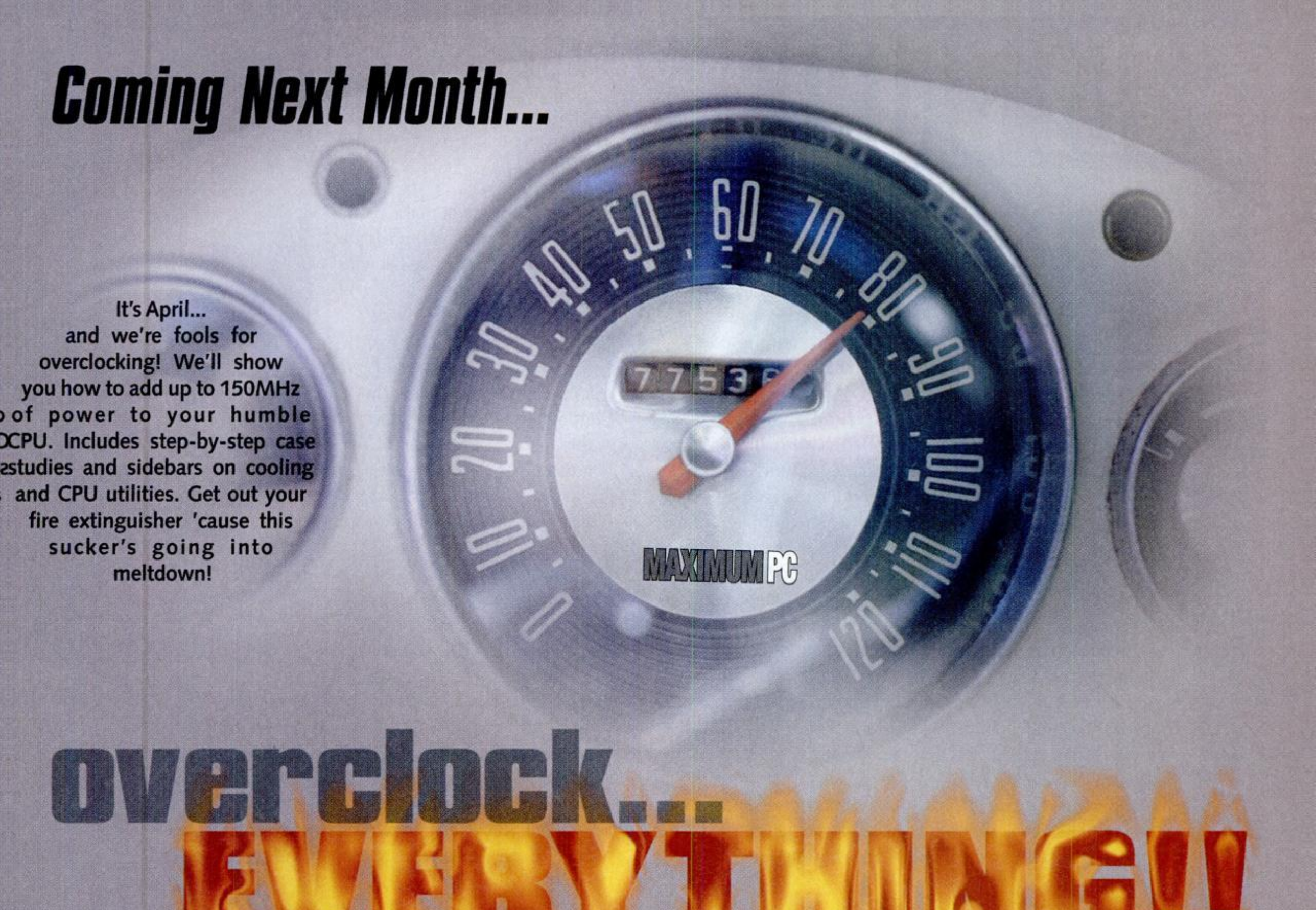


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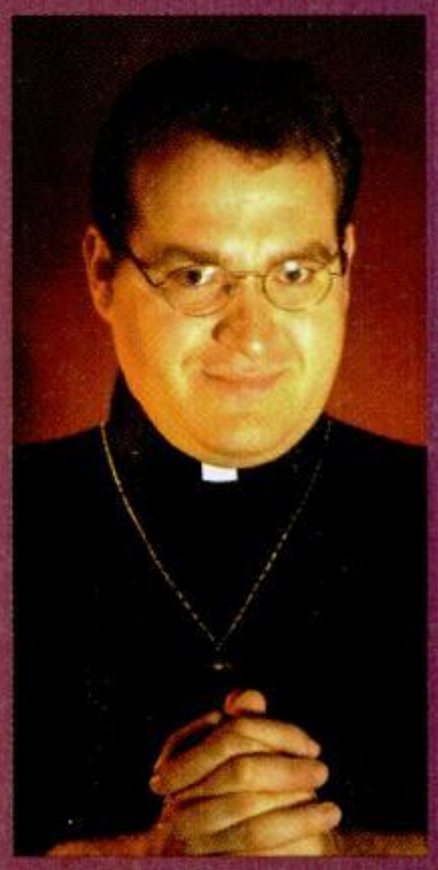

**ALEX ST. JOHN**
was the architect of DirectX while an evangelist at Microsoft. Since leaving the empire, he has remained a player, brokering many deals in the industry. Reach him at **saint@maximumpc.com**.

Back in 1996, in a rare burst of innovation, Microsoft initiated a project called Chrome. The idea was to make arcane multimedia technology, previously confined to game developers, accessible to web designers everywhere.

In November 1998, a few months after releasing version 1.0 to developers, Microsoft canceled the project.

As those who regularly read this column know, I was one of the principal creators of DirectX. What I haven't talked much about is the role I played in the creation of Chrome.

Back in 1996, during one of its frequent reorganizations, Microsoft handed control of DirectX to Deborah Black's new NT multimedia division, and my team joined the company's new Internet division. It was then that we decided to build a browser with the multimedia technology we had just created for games. I built a prototype demonstrating what DirectX-enabled web pages might look like, and Microsoft execs were so impressed that vice president Paul Maritz showed it at that year's Professional Developer Conference. A few months later, we got the green light to build Chrome.

Less than a year later, I was fired from Microsoft after I sent an e-mail criticizing Deborah Black for the mess the company had made of 3D. Chrome proceeded apace without me, until its developer release as "Chromeffects."

While I enjoyed my retirement, traveling the world and writing for *Maximum PC*, Microsoft was experiencing massive growing pains. The company tried to put forward a unified face on its competing operating system divisions—Windows and NT—but the two battled constantly for control. Windows, under Brad Silverberg, had been responsible for nearly all of the company's success in the OS business, but Microsoft secretly knew that Windows was a cobbled together mess that could not sustain the company into the 21st century. Jim Alchin owned NT, which Microsoft intended to migrate all its OS efforts to in the future.

The 1996 reorganization was supposed to relieve the friction by giving control of both operating systems to heir-apparent Alchin, leaving Silverberg with the all-important browser. Two years later, this would prove a bad idea. How can Microsoft credibly testify that *Internet Explorer* is part of the OS when the company has two completely separate product divisions for them?

The answer was simple.

The browser division was stripped from Silverberg and given to Alchin. The creator of the most successful software product in the history of computing was left with no responsibilities.

And with the browser went Chromeffects.

Faced with the prospect of working for Deborah Black, the Chromeffects management team scattered to the far reaches of Microsoft. The NT multimedia group got 250 employees, and a project that smacked of the kind of dominating tactics that irk the DOJ, dropped into its lap. Microsoft opted to just quietly try to sweep the whole thing under the rug until the DOJ lawsuit blows over and the new management has time to figure out what Chrome was all about.

Thus Chrome was snuffed, its corpse harvested quietly for technologies that will be discreetly added to the operating system over time rather than a comprehensive solution to Internet graphics and animation.

For some, the end of Chrome was a tragic end to a great vision, to others it was a thankful reprise to what might have been a terribly effective maneuver by Microsoft to redefine the web in its own image. For me it was a beginning. In the last two months of Chrome's life Microsoft contacted me. With the first version of Chrome complete, Microsoft needed help presenting it to the world. Despite the rocky parting of ways, The Saint is still the greatest multimedia evangelist in the empire's history, so they contracted me to create the first Chromeffects content for the web, and to help Microsoft promote the technology to web designers.

Not wanting to be completely subject to the empire's whim, I immediately began development of an Internet multimedia project of my own. Now with Microsoft's retreat, I'm free to introduce my own solution to interactive 3D graphics for the web. Check it out at **www.WildTangent.com** and let's hope that the best part of this story hasn't been written yet. ✹

# What (Really) Killed Chromeffects

THE TRUTH BEHIND THE SUSPICIOUS DEATH OF A REVOLUTIONARY TECHNOLOGY

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- Dell QuietKey Keyboard
- Logitech First Mouse+ Wheel

★ *Upgrade to a NEW 12.9GB Ultra ATA Hard Drive, add $79.*
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**$1599**

Personal Lease°: $61/Mo., 36 Mos.

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## DELL INSPIRON™ NOTEBOOKS

**Common features for Inspiron 3500:** 3D Surround Sound and Software Wavetabl ◆ MS Windows 98 ◆ Touchpad ◆ 3-Year Limited Warranty† **Common features for In** Ion Battery ◆ MS Windows 98 ◆ Touchpad ◆ 3-Year Limited Warranty† **Upgrades:** Ca

### DELL INSPIRON 3500 D266XT
**PENTIUM II PROCESSOR AT 266MHz**

- 13.3" XGA Active Matrix Display
- 32MB SDRAM (256MB Max)
- 3.2GB Ultra ATA Hard Drive
- Modular 24X Max^^ Variable CD-ROM
- Modular 3.5" Floppy Drive
- MS Office 97 Small Business Edition v2.0

★ *Internal 56K Capable$^{\pi}$ Data/Fax Modem, add $99.*
★ *Upgrade to a 4.3GB Ultra ATA Hard Drive, add $99.*
★ *Upgrade to 64MB SDRAM, add $99.*
★ *APC Notebook Surge Protector, add $29.*

**$1999**

Personal Lease°: $75/Mo., 36 Mos.

**E•VALUE CODE: 88669-800219**

### DELL INSPIRON 7000 A333GT
**PENTIUM II PROCESSOR AT 333MHz**

- 14.1" XGA Active Matrix Display
- 32MB SDRAM (384MB Max$^{\Theta}$)
- 4GB Ultra ATA Hard Drive
- Removable Combo 24X Max^^ Variable CD-ROM and 3.5" Floppy Drive
- 2X AGP 8MB ATI RAGE LT Pro 3D Video
- Internal 56K Capable$^{\pi}$ V.90 Fax Modem with Trial Offer ConnectDirect Internet Access√
- MS Office 97 Small Business Edition v2.0

★ *Upgrade to a 6.4GB Ultra ATA Hard Drive, add $149.*
★ *Upgrade to 64MB SDRAM, add $99.*
★ *Deluxe Nylon Case, add $49.*

**$2599**

Personal Lease°: $97/Mo., 36 Mos.

**E•VALUE CODE: 88669-800225**

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Pricing not discountable. ★Prices and specifications valid in U.S. only and subject to change without notice. †For a complete copy of Guarantees or Limited Warranties, write Dell USA L.P., Attn: Warranties, One Dell Way, Round Rock, TX 78682. **Requires Windows 98. ΔAt-home or on-site service provided via service contract between customer and third-party provider, and is not available in certain remote areas. Technician dispatched if necessary pursuant to phone-based troubleshooting with technical support personnel. ††*PC World* 12/98. **FamilyPC* 9/28/98. ‡‡*PC Computing* 1/99. ^32X Max/14X Min. ^^24X Max/10X Min. πDownload speeds limited to 53Kbps. Upload speeds are less (in the 30Kbps range) and vary by modem manufacturer. Speeds also vary depending on line conditions. Analog phone line and compatible server equipment required. √Offers differ for AT&T WorldNet and GTE Internetworking. Some charges may apply. ΩLimit two (2) per household. Not valid with other Hewlett Packard (HP) offers unless otherwise specified by that offer. Customer will mail in completed rebate coupon(s) and original or copy of receipt(s) dated from 1/31/99 to 5/1/99 for all products. Submissions must be postmarked no later than 5/1/99 and received no later than 5/16/99. Customer will receive a $50 rebate check, approximately 8-10 weeks after receipt of rebate materials. ΘMaximum RAM configurations require a factory installed 128MB SoDIMM, which must be installed at time of initial purchase. Intel, the Intel Inside logo and Pentium are registered trademarks and Celeron is a trademark of Intel Corporation. MS, Microsoft, IntelliMouse and Windows are registered trademarks of Microsoft Corporation. 3Com is a registered trademark of 3Com Corporation. HP and DeskJet are registered trademarks of Hewlett Packard Corporation. Trinitron is a registered trademark of Sony Corporation. ©1999 Dell Computer Corporation. All rights reserved.

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**PENTIUM II PROCESSOR AT 450MHz**

- 128MB 100MHz SDRAM
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- 17" (16.0" viewable, .26dp) M780 Monitor
- 8MB ATI XPERT 98D 3D AGP Graphics Card
- 4.8X DVD-ROM Drive
- Turtle Beach Montego A3D 64V Sound Card
- ACS-295 Speakers with Subwoofer
- MS Works Suite 99 with Money 99 Basic
- Dell Comfort Key Keyboard
- MS IntelliMouse®
- ★ *Upgrade to a 17" (16.0" viewable) Trinitron® 1000HS Monitor, add $109.*
- ★ *Iomega Zip 100MB Internal Drive with Two Cartridges, add $99.*

**$1999**

Personal Lease°: $75/Mo., 36 Mos.

**E•VALUE CODE: 88669-500219**

### DELL DIMENSION XPS R450
**PENTIUM II PROCESSOR AT 450MHz**

- 128MB 100MHz SDRAM
- 12.9GB Ultra ATA Hard Drive
- 17" (16.0" viewable, .26dp) Trinitron 1000HS Monitor
- 8MB ATI XPERT 98D 3D AGP Graphics Card
- 4.8X DVD-ROM Drive
- Turtle Beach Montego II A3D 320V Sound Card
- ACS-495 Dolby Surround Sound Speakers with Subwoofer
- Iomega Zip 100MB Internal Drive
- MS Works Suite 99 with Money 99 Basic
- Dell Comfort Key Keyboard
- Logitech MouseMan Wheel

**$2299**

Personal Lease°: $86/Mo., 36 Mos.

**E•VALUE CODE: 88669-500222**

### DELL DIMENSION XPS R450
**PENTIUM II PROCESSOR AT 450MHz**

- 128MB 100MHz SDRAM
- *NEW* 17.2GB Ultra ATA Hard Drive
- *NEW* 19" (18.0" viewable, .26dp) Trinitron P990 Monitor
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- 4.8X DVD-ROM Drive and Decoder Card with TV Out
- Turtle Beach Montego II A3D 320V Sound Card
- *NEW* ADA880 Dolby Digital Speakers with Subwoofer
- MS Office 97 Small Business Edition v2.0 plus Encarta Encyclopedia
- Dell Comfort Key Keyboard
- Logitech MouseMan Wheel

**$2899**

Personal Lease°: $108/Mo., 36 Mos.

**E•VALUE CODE: 88669-500228A**

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**Microsoft Works Suite 99:**
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### DELL INSPIRON 7000 A333LT
**PENTIUM II PROCESSOR AT 333MHz**

- 15" XGA Active Matrix Display
- 64MB SDRAM (384MB Max⊖)
- 6.4GB Ultra ATA Hard Drive
- Removable Combo 24X Max^^ Variable CD-ROM and 3.5" Floppy Drive
- 2X AGP 8MB ATI RAGE LT Pro 3D Video
- Internal 56K Capableπ V.90 Fax Modem with Trial Offer ConnectDirect Internet Access√
- MS Works Suite 99 with Money 99 Basic
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- ★ *Leather Carrying Case, add $99.*

**$2999**

Personal Lease°: $112/Mo., 36 Mos.

**E•VALUE CODE: 88669-800229**

### DELL INSPIRON 7000 A366LT
**PENTIUM II PROCESSOR AT 366MHz**

- 15" XGA Active Matrix Display
- 96MB SDRAM (384MB Max⊖)
- 6.4GB Ultra ATA Hard Drive
- Removable Combo 2X DVD-ROM and 3.5" Floppy Drive
- 2X AGP 8MB ATI RAGE LT Pro 3D Video
- Internal 56K Capableπ V.90 Fax Modem with Trial Offer ConnectDirect Internet Access√
- MS Works Suite 99 with Money 99 Basic
- ★ *APC Notebook Surge Protector, add $29.*
- ★ *Upgrade to 128MB SDRAM, add $99.*

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Personal Lease°: $130/Mo., 36 Mos.

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- ACS-295 Speakers with Subwoofer
- 3Com® USR V.90 PCI WinModem with Trial Offer ConnectDirect℠ Internet Access√
- MS® Office 97 Small Business Edition v2.0 plus Encarta Encyclopedia 98 (Ask about Our *FREE* Office 2000 Upgrade Offer)
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